Chapter 4. Aviation System Issues

4.1. Introduction

The aviation industry is constantly evolving to keep pace with advances in technology; economic conditions; local, state, and federal regulatory requirements; traveler behavior trends; and other factors inherent to and external from the airport environment. Within this context, airports and sponsors are responsible for maintaining safe and secure aviation facilities that meet user demands. Fiscal resources are often constrained and can vary year-to-year based on how policymakers allocate and prioritize available dollars. Understanding the key issues facing Illinois's airport system—both today and expected to in the years ahead—is a critical task when assessing the system's current and anticipated future demands.

This chapter of the Illinois Aviation System Plan (IASP) summarizes the issues and trends with the highest potential to impact the state aviation system over the 20-year planning horizon. Issues were identified by the Illinois Department of Transportation (IDOT), airport sponsors, and other stakeholders representing a diversity of perspectives on the Illinois aviation system. These sources included:

- Technical Advisory Committee (TAC) members: Serving as the steering committee for the IASP, the TAC is composed of advocates from the public and private sector involved with transportation and economic development in Illinois. Members represent Illinois airports; IDOT; and organizations including the Aircraft Owners and Pilots Association (AOPA), Chicago Metropolitan Agency for Planning, Illinois Air and Critical Transport, Illinois Aviation Trades Association, Illinois Chamber of Commerce, and United Airlines. During its initial meeting on December 4, 2019, the TAC prioritized issues that may affect Illinois airports in the near- and long-terms.
- Airport manager interviews: During the IASP, virtual site visits were conducted at all 11 commercial service and 74 general aviation (GA) airports that comprise the state airport system. As part of this effort, airport managers reported the three most pressing issues facing their facilities on the Inventory Data Form. Airport managers reported airport-specific issues such as hangar shortages and aging infrastructure as well as broader issues including regional growth and funding availability.
- Stakeholder interviews: The IASP project team interviewed stakeholders representing a cross-section of aviation users and industry representatives including state government, university, and airline staff; aviation advocacy groups; pilots' associations; and companies that rely on corporate aviation. Interviewees discussed areas that have the greatest potential to impact the Illinois aviation system over time.

After development of a comprehensive list of potential aviation issues, the study team selected the most pressing concerns for further analysis. In addition, the COVID-19 pandemic arose during the development of the IASP in early 2020, which has significantly affected aviation within the state and around the globe. COVID-19's impacts are still ongoing at the time of this writing (January 2021), and their full extent and severity are currently unknown. The pandemic may exacerbate other issues affecting airports, such as providing for adequate security checkpoint space in aging terminal facilities in consideration of social distancing requirements. The potential impacts of COVID-19 and the other priority issues that may affect Illinois airports are summarized in **Table 4.1**. Additional information about each of these topics is presented in **Section 4.4**. Issues are presented alphabetically, which does not represent their relative importance.

Table 4.1. Key Illinois Issues

Issue	Overview
Aging Infrastructure	Airports across Illinois report that aging infrastructure is their top concern. Infrastructure exceeding its useful life or with deferred maintenance needs can affect airports' operational efficiency and ultimately cost more when major reconstruction or replacement become warranted. Poorly maintained or outdated infrastructure may result in some passenger and aircraft owners/pilots choosing to use alternative airports. Among other impacts, this can result in demand imbalances at the regional level. Adequately maintaining facilities using a coordinated asset management approach reduces lifecycle costs and supports an efficient airport system for all users. 
Aviation Workforce Shortage	Demand for commercial service and some sectors of GA continues to rise, yet the number of aviation professionals is on the decline. Among other causes, many qualified pilots are reaching federally mandated retirement ages, fewer trained personnel are coming out of the military, and potential students are deterred by high educational costs coupled with low starting salaries. The aviation workforce shortage not only applies to pilots, but also mechanics, flight instructors, and other industry staff. Addressing this shortage will take a collaborative effort between all segments of the workforce development chain including state and federal agencies, airlines, educational providers, airports, and other industry advocates. 
COVID-19	The arrival of COVID-19 at the global level in early spring 2020 initiated a virtual shutdown of commercial passenger traffic almost overnight. While domestic leisure travelers have now begun to return to the skies, many companies have prohibited employees from traveling for business for the foreseeable future. International passenger travel remains highly impacted as countries close their borders to slow the spread of the virus. GA activity has been more variably affected, with impacts differing between sectors and geographies. Air cargo has fared best, with growth ostensibly constrained more by available cargo capacity than demand. While vaccination programs are now underway worldwide, a "return to normal" may yet be months—if not years—away. 
Unmanned Aerial Systems (UAS) and Commercial Space	Emerging aviation technologies including UAS and commercial space systems have exponentially increased in recent years, with some industry analysts likening their transformational power to the jet engine over eighty years ago. Both technologies offer numerous opportunities for commercial, military, educational, and other applications. As UAS usages expand and the privatization of space continues to develop, it will be important to assess impacts on the National Airspace System (NAS) and airports to promote safety and operational efficiency for traditional and emerging users. 

Issue	Overview
FBO Pricing Transparency	Fixed base operators (FBOs) offer critical services to GA users at commercial service and GA airports. These businesses provide aviation services such as fueling, aircraft storage, maintenance, and aircraft handling. FBO pilots' lounges often provide a relaxing and friendly place for pilots and passengers to rest and flight plan. While a vital link within the GA community, pilots sometimes report unexpected ancillary costs associated with landing fees, ramp storage, and other services. FBO fee structures can be complicated and change without notice—causing confusion and frustration amongst pilots forced to pay charges viewed as high. Increased FBO fee transparency allows pilots to be informed consumers about where they land—resulting in more satisfied, repeat customers for the FBO and the airport at which it is located.
Growth of E-commerce	Consumers' reliance on e-commerce has grown rapidly in recently years, a trend that has only accelerated since the start of the COVID-19 pandemic. Consumers increasingly expect near-immediate delivery of purchases, and air cargo is now used for the transportation of all types of durable and non-durable goods. This has placed new demands on air cargo handling facilities and increased truck traffic around airports for last-mile connection needs. Such demands are projected to grow in the coming decades—placing new stress on an already constrained system.
Fuel Availability	Airport managers and stakeholders frequently cited the availability and cost of fuel in Illinois as major issues affecting aviation in the state. Airports that offer fuel are more attractive to aircraft owners/pilots when choosing where to base their aircraft. Pilots often make decisions on where to fly based on the cost of fuel at potential destination airports. Fuel sales provide an important revenue source for some airports and can be a factor in where aviation-related businesses locate. Recent changes to state fuel taxes have increased the price of flying and decreased airport revenues, causing concerns with both airport managers and many aviation users.
PFAS	Per- and polyfluoroalkyl substances (PFASs) are found in many types of aqueous film-forming foams (AFFFs) used for airport/aircraft firefighting activities. Because PFASs are toxic to the environment and human health, state and federal government agencies are implementing regulations governing their usage. It is important for airports to understand the issues associated with PFASs, identify potential areas of concern at their facilities, and implement remediation techniques to ensure regulatory compliance and the highest feasible level of environmental stewardship.

Issue	Overview
Rebuild Illinois Bill	In 2019, Governor J.B. Pritzker approved $45 billion dollars to improve Illinois's infrastructure, state facilities, and educational system. Approximately $23.3 billion is earmarked specifically for transportation assets including roads, bridges, ports, and airports. With funds available over a six-year period, the Rebuild Illinois Bill has the potential to close significant funding gaps affecting Illinois's airports and address many of the projects identified by individual airports and through the IASP.
Runway Condition	Properly maintained runways adequately sized for the type and frequency of aviation activities they support are fundamental to a safe and efficient airport system. Airport managers across Illinois cited concerns regarding pavement conditions, which can be costly to repair but can also present threats to safety and operational efficiency. Runway length is a key factor of the type of aircraft that can use an airport as well as its operational capacity.

Source: Kimley-Horn, 2020

Each of the priority issues affecting the Illinois airport system have a relationship with the IASP goal categories introduced in **Chapter 1**. Developed in accordance with IDOT's Long Range Transportation Plan, the study goals articulate IDOT's specific vision for aviation in the state. They provide guidance on the future the agency would like to create and are the framework by which progress is evaluated. Considering issues in the context of the goals that they affect may help guide IASP recommendations and focus future implementation efforts. Further, linking goals, issues, and future recommendations highlights the IASP's role in meeting the needs of aviation today and looking ahead. The IASP goals are presented below, with the relationship between IASP goals and priority issues presented in **Table 4.2**.

Goal 1: Economy. Improve Illinois's economy by providing transportation infrastructure that supports the efficient movement of people and goods.

Goal 2: Livability. Enhance the quality of life across the state by ensuring that transportation investments advance local goals, provide multimodal options, and preserve the environment.

Goal 3: Mobility. Support all modes of transportation to improve the accessibility and safety by improving connections between all modes of transportation.

Goal 4: Resiliency. Proactively assess, plan, and invest in the state's transportation system to ensure our infrastructure is prepared to sustain and recover from extreme events and other disruptions.

Goal 5: Stewardship. Safeguard existing funding and increase revenues to support system maintenance, modernization, and strategic growth of Illinois's transportation system.

Table 4.2. Issues and Goals Matrix

Issue	Goal #1: Economy	Goal #2: Livability	Goal #3: Mobility	Goal #4: Resiliency	Goal #5: Stewardship
Aging Infrastructure	✓	✓	✓	✓	✓
Aviation Industry Workforce Shortage	✓				✓
COVID-19	✓			✓	
Drones and Commercial Space	✓				✓
FBO Pricing Transparency	✓				
Fuel	✓	✓		✓	✓
Growth of E-Commerce	✓		✓		✓
PFAS	✓	✓			✓
Rebuild Illinois Bill	✓	✓	✓	✓	✓
Runway Condition	✓				✓

Source: Kimley-Horn, 2020

4.2. Aging Infrastructure

From airfield pavement maintenance, rehabilitation, and reconstructions to terminal renovations, Illinois's 85 system airports constantly require updates to provide safe, efficient, and modern facilities to support the aircraft, pilots, passengers, and air cargo they support. In 2021, 48 rehabilitation and reconstruction projects are programmed to receive approximately $312 million in local, state, and federal funding—accounting for 85 percent of total funding programmed for the year. Yet with passenger and air cargo traffic witnessing year-over-year growth (at least prior to COVID-19), this level of investment is not keeping pace with investment needs across Illinois. In a 2019 report, Airports Council International (ACI) reported that Illinois airports require $5.2 billion in infrastructure improvements through 2023.[15] This includes capacity enhancements to serve more passengers and larger aircraft; implement new airside standards and security requirements; reconstruct existing infrastructure; and enhance multimodal access, environmental stewardship, and the passenger experience. The significant gap between available funding and investment needs may hinder the system's ability to meet the growing needs of businesses and travelers in the years ahead and diminish airports' roles as economic engines for their communities and the state.

Growing concern about the state of Illinois's aging airport infrastructure became clear during the data collection efforts of the IASP. Over half of airport managers reported facility improvement needs as one of their most pressing concerns. More specifically, stakeholders most commonly identified the conditions of following infrastructure types as potentially hindering the operational capabilities of Illinois airports over the 20-year planning horizon of the IASP:

- Pavement
- Hangar
- Terminal buildings

Each of these specific concerns is discussed in more detail in the sections that follow. Additionally, the IASP established the "percent of airports with aging facilities as defined by the FAA" as one of the study's performance indicators. The results of this analysis are presented in **Chapter 3. Inventory and Existing System Adequacy**.

4.2.1. Pavement

Airside pavement is an airport's most vital asset and typically represents one of its most significant investments. Pavement must be kept in a condition that allows for safe and efficient aircraft operations. Pavement condition is expressed in terms of the Pavement Condition Index (PCI), with 100 indicating perfect condition and 0 indicating complete failure.

Acceptable levels of service in terms of PCI depend on various factors including airport type and size, pavement facility type (e.g., runways, taxiways, and aprons), and number of aircraft operations and aircraft size.[16] In general, pavements that support more frequent and demanding operations in terms of aircraft weight and speed should be maintained at higher levels of service than less frequently used

[15] ACI (2019). *Terminally Challenged: Addressing the Infrastructure Funding Shortfall of America's Airports.* Available online at https://airportscouncil.org/wp-content/uploads/2019/02/2019TerminallyChallenged-Web-Final.pdf (accessed January 2021).
[16] ACRP (2011). Synthesis Report 22: *Common Airport Pavement Maintenance Practices*. p. 29. Available online at https://www.nap.edu/catalog/14500/common-airport-pavement-maintenance-practices (accessed January 2021).

pavements supporting less-demanding operations. Once pavements fall below acceptable PCI thresholds, suggested maintenance and repair treatments are applied based on the severity of distress and type of pavement (i.e., asphalt concrete [AC] versus Portland concrete cement [PCC]). The Airport Cooperative Research Program's (ACRP) Synthesis Report 22: *Common Airport Pavement Maintenance Practices*, identifies 24 repair treatments for AC, PCC, or both pavement types. These treatments are presented in **Table 4.3**.

Table 4.3. Pavement Preservation Treatments by Pavement Type

AC Pavement	PCC Pavement	Both Pavement Types (AC and PCC)
Sealing and filling of cracks (with hot or cold applied sealants)	Joint and crack sealing (with bituminous, silicone, or compression sealants)	Texturization using shot blasting
Small area patching (using hot mix, cold mix, or proprietary material)	Partial depth repairs (using AC, PCC, and proprietary materials	Diamond grinding
Spray patching (manual chip seal	Full-depth repairs (using AC, PCC, and proprietary materials	Microsurfacing
and mechanized spray patching)	Machine patching using hot mix	
Machine patching with AC material	Slab stabilization and slab-jacking	
Rejuvenators and seals	Load transfer	
Texturization using fine milling	Crack and joint stitching	
Surface treatment (chip seal, chip seal coat)	Hot-mix overlays	
Slurry seal	Bonded PCC overlay	
Hot-mix overlay (includes milling of AC pavements)	Joint and crack sealing (with bituminous, silicone, or compression sealants)	
Hot in-place recycling	Partial depth repairs (using AC, PCC, and proprietary materials	
Cold in-place recycling		
Ultra-thin whitetopping		

Source: ACRP, 2011

It is most critical to monitor and maintain airports' primary runways and taxiways due to the demands placed upon these pavement areas. Accordingly, the IASP established that all primary runways and taxiways should be maintained at a PCI of 70 or greater as a performance indicator. As further detailed in **Chapter 3**, 61 percent of all primary runways and 58 percent of all primary taxiways achieve these levels (see **Figure 4.1** and **Figure 4.2**, respectively).

Figure 4.1. Systemwide Performance, Primary Runways

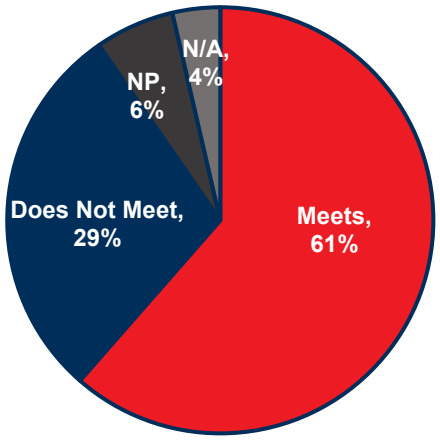
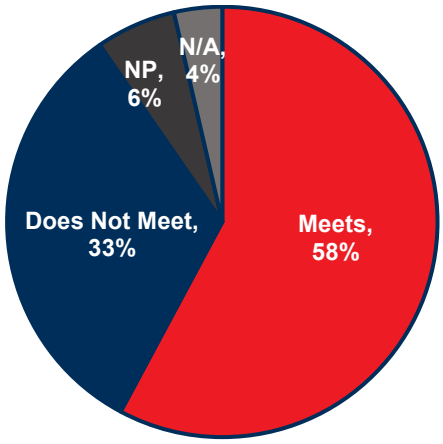


Figure 4.2. Systemwide Performance, Primary Taxiways



Notes: NP indicates that data was not provided for this analysis. N/A indicates the system's three turf runways/taxiways, which are not applicable for this analysis. Sources: IDOT PCI Database, 2020; IASP Inventory Form, 2020; Kimley-Horn, 2020

The IASP also assessed the percent of airside pavement within its useful life as defined by the FAA including:

- New or fully reconstruction airside pavement less than 20 years old
- Rehabilitated airside pavement less than 10 years old

With 83 percent of airside pavement older than 20 years old or 90 percent of pavement rehabilitated more than 10 years ago, pavement age may well become a major investment need in Illinois (see **Figure 4.3** and **Figure 4.4**, respectively).

Figure 4.3. Systemwide Performance, Airside Pavement Less than 20 Years Old

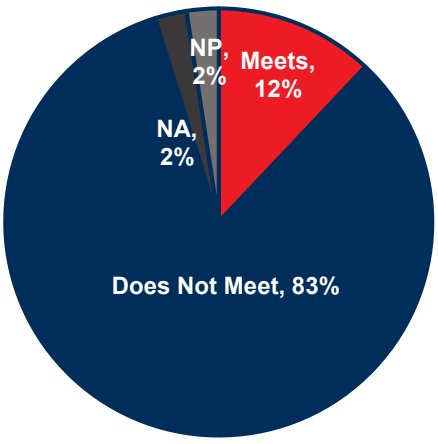
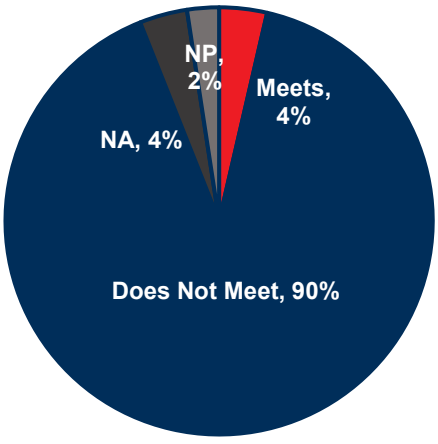


Figure 4.4. Systemwide Performance, Rehabilitated Pavement Less than 10 Years Old



Notes: NP indicates that data was not provided for this analysis. N/A indicates the system's three turf runways/taxiways, which are not applicable for this analysis. Sources: IASP Inventory Form, 2020; Kimley-Horn, 2020

4.2.2. Hangars

Hangars are enclosed buildings used to secure and store aircraft. Hangars shelter aircraft from external elements such as weather (e.g., snow, rain, hail, sun, etc.), dust, and wildlife. Each of these factors can cause significant and expensive cosmetic and operational damage and ultimately reduce the longevity of peak aircraft performance. Because aircraft are significant investments that should be protected, most aircraft owners prefer to store their aircraft in hangar facilities. Hangars vary widely in terms of condition, size, and available amenities (such as heat and other available utilities) although there are two main types: conventional or box hangars and nested T-hangars. Larger and more sophisticated aircraft are typically stored in conventional hangars while small GA aircraft are commonly stored in nested T-hangars. The availability of hangars supports existing and draws new based and transient aircraft, attracts new businesses, and can generate additional airport revenue. As such, the availability of well-maintained and managed hangars can be an important element of a financially secure and self-sufficient airport.

There are approximately 4,150 hangar spaces at Illinois system airports. Similar to pavement conditions discussed above, the IASP evaluated the percent of airports in the state where all hangars structures are less than 20 years old. This analysis revealed that 88 percent of airports have at least one hangar facility exceeding its useful life (defined as structures less than 20 years old). While a vital asset within the Illinois airport system, many airports will likely struggle to find enough funding to maintain hangars in adequate condition as existing facilities deteriorate. Furthermore, new hangar development can also be challenging. As a State Block Grant Program participant, IDOT selects projects to receive federal AIP funding in accordance with the FAA's National Priority Rating (NPR) system. AIP funds can be used to construct hangars at Nonprimary airports; however, all airside development needs must first be met. Other potential funding sources include public or private loans and municipal government bonds. Airports can also partner with private developers to construct hangars on airport property via ground leases.

Regardless of ownership (airport sponsor or private investor), the return on investment on hangar development can be considerably long and assets will depreciate over time. Airports can also seek creative and unique solutions to fund new and maintain existing facilities. The Southern Illinois Airport received a $3.75 million grant from the U.S. Department of Commerce in 2018 to construct two new conventional hangars. One hangar provides additional storage capacity in the region and the second supports on-airport business tenants.[17] Both uses exemplify how hangars are critical in supporting an airport's economic contribution to its community and the state.

4.2.3. Terminal Buildings

Terminal buildings are an essential component of commercial service airports and valuable assets for many GA facilities. In nearly all cases, terminals serve as the nexus between aircraft and pilots and passengers, ground transportation systems, and other landside facilities. Because most passengers only interface with a terminal complex, their experience within and opinion of the terminal is a major driver of their willingness to use the airport in the future.

Commercial service and GA terminals differ considerably in terms of available services, amenities, and facilities. GA terminals can simply provide an area for pilots to conduct flight planning activities and for airport users to wait and relax prior to and after flight. Many GA terminal offer lounge areas, restrooms,

[17] https://www.dailyherald.com/article/20181007/news/310079956

and access to Wi-Fi. Terminals can also host concessionaires and other on-airport businesses that generate an important source of revenue for some airports though leases and sales commissions.

Commercial service terminal facilities are significantly more complicated, with facility requirements driven in large part by passenger levels, airside needs, and regulatory mandates. Airside terminal design accounts for aircraft parking, maneuvering, and service needs; ground support equipment movement and storage requirements; environmental, security, and emergency responses considerations; blast fence placement; and winter operation needs including aircraft deicing and apron snow removal. Terminal building design must not only meet regulatory requirements but also provide for a functional and user-friendly experience. The key components of terminal building design include passenger levels, concessions planning, security screening requirements, the efficient movement of people and baggage, and the incorporation of sustainability and demand management concepts. Airports should also consider current needs and future flexibility during terminal replacement and rehabilitation projects as demand and regulations will change over time.

All of Illinois's 12 commercial service airports have a commercial service terminal and 84 percent of all airports have a GA terminal. Only 12 percent of terminal buildings in Illinois are less than 40 years—a figure that portends significant investment needs in the years ahead. Nearly one-third of airport managers reported terminal replacement or rehabilitation needs during the IASP inventory process, with 17 percent of respondents indicating an aging terminal building as one of their top three concerns.

4.2.4. Next Steps

Across the U.S., investments into airports are failing to keep pace with passenger and cargo demands. The significant gap between investment need and availability is becoming increasingly evident in the condition of airside and landside facilities and impacting nearly all types of airport users. Furthermore, some travelers are choosing to bypass air travel all together. The U.S. Travel Association reported that "Americans skipped more than 30 million air trips in 2016 due to airport hassles, costing our economy more than $24 billion."[18] Congestion within terminals and outdated facilities is affecting national and state economies, with the issue only worsening as deferred maintenance needs continue to grow.

In March 2020, the Coronavirus Aid, Relief, and Economic Security (CARES) Act (H.R. 748, Public Law 116-136) included $10 billion in funding for airports included in the National Plan of Integrated Airport Systems (NPIAS). The subsequent Coronavirus Response and Relief Supplemental Appropriations Act (CRRSAA) (H.R. 133), signed into law in December 2020, included an additional $2 billion in economic relief to NPIAS airports. At the time of this writing (January 2021), 78 Illinois airports have received additional federal funding as a result of these Coronavirus relief acts. These federal dollars are one step towards addressing the transportation infrastructure concerns cited by many aviation stakeholders in Illinois.

[18] U.S. Travel Association (2018). "Building the Next Generation of Travel Infrastructure." Available online at https://www.ustravel.org/sites/default/files/media_root/document/InfrastructureRecommendations_2018.pdf (accessed January 202).

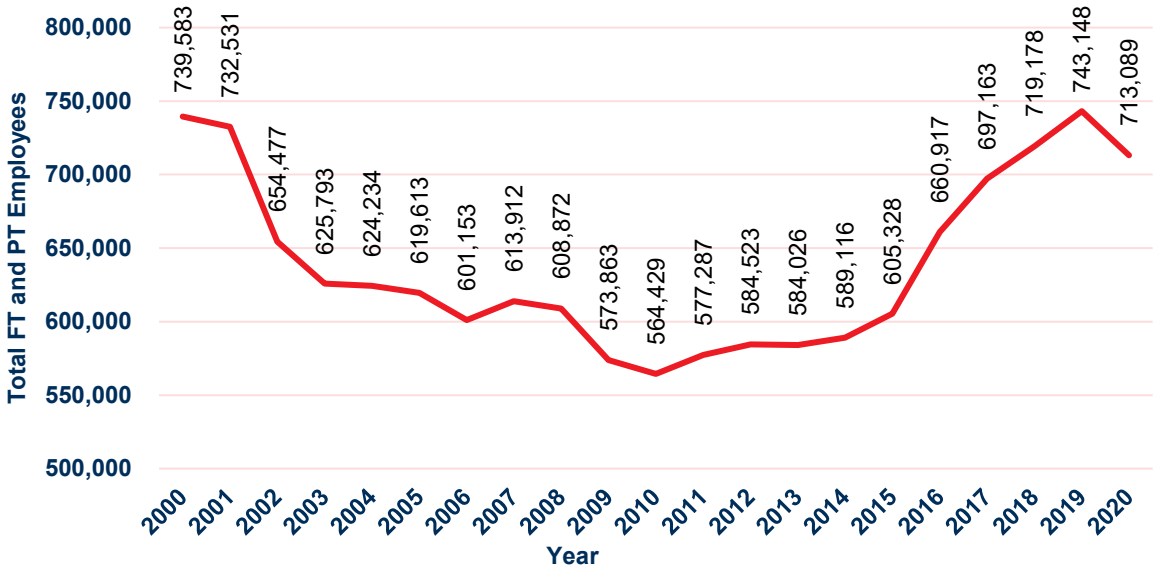
4.3. Aviation Industry Workforce Shortage

The demand for aviation has grown steadily since the economic recovery following the Great Recession, driven by positive economic growth, increasing populations, rising reliance on air cargo, and numerous other factors. Between 2014 and 2019, the U.S. witnessed year-over-year passenger growth, and 2019 marked the 11th consecutive year of profitability for U.S. airlines. The FAA and other industry analysts had predicted these trends to continue into 2020 (prior to COVID-19), with growth anticipated in all indicators of commercial service and air cargo activities and some sectors of GA. Yet despite the economic strength of aviation, the industry has been plagued by workforce shortages affecting nearly all categories of employment including pilots, mechanics, and air traffic controllers.

Companies have long relied on the military as a source of pilots and other skilled workers. However, as military forces are reduced, fewer former military personnel are now available to transition into civilian aviation careers. The overall U.S. labor pool has been on the decline over the past 60 years. Additionally, the need for some college, military experience, and/or specialized training and licensure coupled with low starting wages can deter potential students or professionals from pursuing a career in aviation. If the number of aviation professionals available in the workforce cannot keep pace with growing demands, the aviation industry—and the many industries that rely on it—may too be forced to pause.

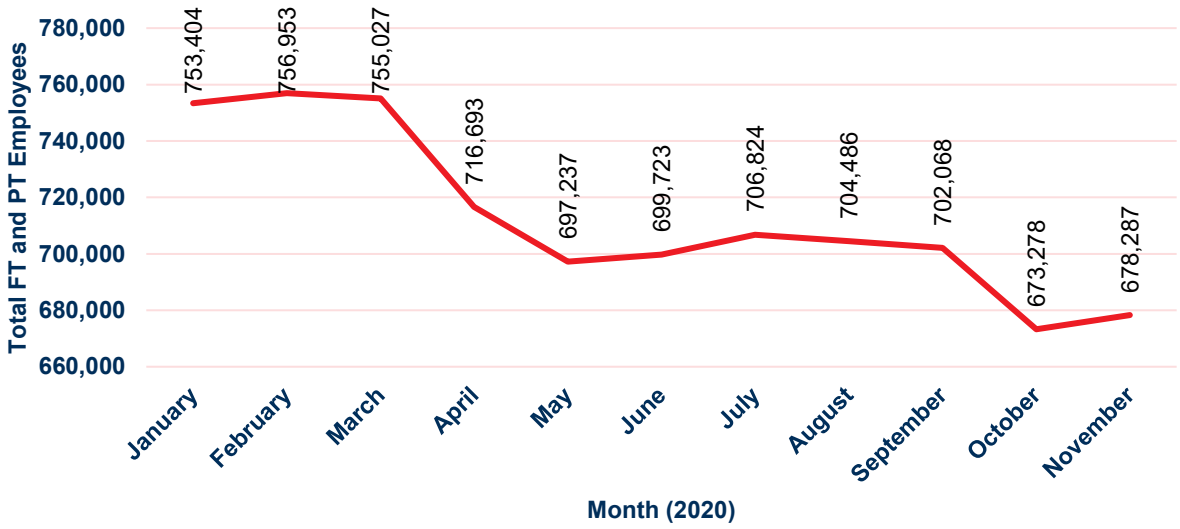
Although the aviation workforce shortage has been on the industry's radar for a number of years, the COVID-19 pandemic may have changed the industry workforce landscape, at least in the near-term. Nearly all scheduled commercial airlines have experienced substantial losses in revenue in the wake of the pandemic, forcing widespread workforce furloughs and lay-offs. Affected workers include pilots, mechanics, operations personnel, flight attendants, and others. As shown in **Figure 4.5**, U.S. airlines lost over 30,000 workers between 2019 and 2020, with the sharpest declines witnessed immediately following the emergence of the pandemic in March 2020 (see **Figure 4.6**). These reductions have deferred the point at which the workforce shortage will fully impact the industry, but with signs of recovery already apparent, the respite is undoubtedly temporary.

Figure 4.5. Total U.S. Full- and Part-time Domestic Airline Employees, 2010 - 2020



Note: Data unavailable for December 2020. Source: Bureau of Transportation Statistics (BTS), Schedule P-1(a), 2021

Figure 4.6. Total U.S. Full- and Part-time Airline Domestic Airline Employees by Month, 2020



Note: Data unavailable for December 2020. Source: BTS, Schedule P-1(a), 2021

The following sections present a more detailed analysis of three key workforce issues that may affect the Illinois aviation landscape.

4.3.1. Pilots

A primary concern for the aviation industry globally is the growing gap between increasing pilot demand and the declining number of certified pilots currently and projected in the coming years. Forecasts before COVID-19 showed nearly 20,000 U.S. airline pilots will reach the FAA's mandatory retirement age of 65 by 2020—representing almost 16 percent of all airline pilots in the U.S. Such a decline would likely cause ripple effects throughout the entire U.S. economy.[19] Pre-COVID-19 projections by Boeing anticipate the national U.S. aviation industry will need 117,000 new pilots to accommodate growing air travel demands through 2036. New FAA training regulations have increased flight time requirements for commercial pilots and fewer military-trained pilots are entering a civilian aviation career. In 2013, the FAA implemented a rule that all first officers of commercial airline flights hold an Air Transport Pilot (ATP) license requiring a minimum of 1,500 flight hours. Prior to the 2013 rule, entry-level first officers could be employed with a commercial pilot license requiring 250 hours. Prospective pilots also face high educational costs, extensive and lengthy educational and licensing requirements, and relatively low entry-level salaries.

As a result of these and other issues, student pilots are not matriculating quickly enough to fill commercial pilot positions. The shortages are particularly acute for regional carriers, as pilots often transition to larger, long-haul carriers offering higher wages and better benefits as they obtain more flight hours. shows the number of active pilots by type of certificate between 2010 and 2019. The total number of pilots, minus students, decreased by 0.9 percent, with declines experienced specifically in the recreational, private, commercial, rotorcraft, and glider categories (instrument rated pilots are also anticipated to decline slightly; however, these pilots are already accounted for in other categories and do not represent an additional group). The sport pilot and ATP categories do show 6.5 and 1.7 percent growths, respectively.

[19] aviationweek.com/commercial-aviation/coming-us-pilot-shortage-real

Table 4.4. Active Pilots by Type of Certificate, Excluding Student Pilots, 2010 - 2019[1,2]

Year	Recreational	Sport Pilot	Private	Commercial	Airline Transport	Rotorcraft Only	Glider Only	Total Less Student Pilots	Instrument Rated Pilots[3]
2010	212	3,682	202,020	123,705	142,198	15,377	21,275	508,469	318,001
2011	227	4,066	194,441	120,865	142,511	15,220	21,141	498,471	314,122
2012	218	4,493	188,001	116,400	145,590	15,126	20,802	490,630	311,952
2013	238	4,824	180,214	108,206	149,824	15,114	20,381	478,801	307,120
2014	220	5,157	174,883	104,322	152,933	15,511	19,927	472,953	306,066
2015	190	5,482	170,718	101,164	154,730	15,566	19,460	467,310	304,329
2016	175	5,889	162,313	96,081	157,894	15,518	17,991	455,861	302,572
2017	153	6,097	162,455	98,161	159,825	15,355	18,139	460,185	306,652
2018	144	6,246	163,695	99,880	162,145	15,033	18,370	465,513	311,017
2019	127	6,467	161,105	100,863	164,947	14,248	19,143	466,900	314,168
Average Annual Growth									
2010-19	-5.5%	6.5%	-2.5%	-2.2%	1.7%	-0.8%	-1.2%	-0.9%	-0.1%

Notes: (1) An active pilot is a person with a pilot certificate and a valid medical certificate. (2) Starting with April 2016, there is no expiration date on the new student pilot certificates. This generates a cumulative increase in the student pilot numbers and breaks the link between student pilot and private pilot or higher-level certificates. Since there is no sufficient data yet to forecast, the student certificates under the new rule, student pilot forecast is suspended and excluded from this table. (3) Instrument rated pilots should not be added to other categories in deriving total. Source: FAA U.S. Civil Airmen Statistics, 2020

In the year ahead, the FAA does anticipate some growth over the forecast horizon, as shown in **Table 4.4**. The sport pilot category is anticipated to increase most notably at 3.4 percent, with small gains anticipated in the ATP, rotorcraft, and glider categories. In total, the FAA anticipates 0.1 percent growth across all categories (less student pilots). Note the FAA has currently suspended student pilot forecasts for the third year in a row due to a 2016 regulatory change. Between 2016 and 2019, the student pilot population has increased from 128,501 to 197,665.

Table 4.5. Forecasted Active Pilots by Type of Certificate, Excluding Student Pilots, 2019 - 2030[1,2]

Year	Recreational	Sport Pilot	Private	Commercial	Airline Transport	Rotorcraft Only	Glider Only	Total Less Student Pilots	Instrument Rated Pilots[3]
2019	127	6,467	161,105	100,863	164,947	14,248	19,143	466,900	314,168
Forecast									
2020	125	6,740	161,700	100,950	166,900	14,100	19,350	469,865	316,300
2021	120	7,015	161,650	101,000	167,600	14,000	19,550	470,935	317,500
2022	115	7,290	161,150	101,000	168,500	14,050	19,700	471,805	318,800
2023	115	7,565	160,300	100,950	169,300	14,150	19,850	472,230	320,000

Year	Recreational	Sport Pilot	Private	Commercial	Airline Transport	Rotorcraft Only	Glider Only	Total Less Student Pilots	Instrument Rated Pilots[3]
2024	115	7,840	159,200	100,900	170,200	14,300	19,950	472,505	321,300
2025	110	8,110	157,900	100,800	171,100	14,500	20,050	472,570	322,700
2026	105	8,375	156,500	100,650	172,100	14,700	20,150	472,580	324,000
2027	100	8,635	155,050	100,550	173,200	14,900	20,200	472,635	325,300
2028	95	8,895	153,550	100,400	174,400	15,150	20,250	472,740	326,600
2029	90	9,150	152,100	100,250	175,600	15,400	20,250	472,840	327,900
Average Annual Growth									
2019-20	-1.6%	4.2%	0.4%	0.1%	1.2%	-1.0%	1.1%	0.6%	0.7%
2020-30	-3.2%	3.4%	-0.7%	-0.1%	0.6%	1.1%	0.5%	0.1%	0.4%

Notes: (1) An active pilot is a person with a pilot certificate and a valid medical certificate. (2) Starting with April 2016, there is no expiration date on the new student pilot certificates. This generates a cumulative increase in the student pilot numbers and breaks the link between student pilot and private pilot or higher-level certificates. Since there is no sufficient data yet to forecast, the student certificates under the new rule, student pilot forecast is suspended and excluded from this table. (2) Instrument rated pilots should not be added to other categories in deriving total. Source: FAA U.S. Civil Airmen Statistics, 2019

The total number of pilots by category in Illinois and the total U.S. is provided in **Table 4.6**. Illinois is home to 2.8 percent of the total number of pilots in the U.S. Illinois witnessed a small increase in the total number of pilots in the state between 2018 and 2019, rising from 17,105 to 17,721.

Table 4.6. Pilots by Category, U.S., Illinois, and Percent of U.S. Total

Category	U.S. Total	Illinois	Percent of U.S. Total
Students	185,835	5,048	2.7%
Private[1]	165,813	4,840	2.9%
Commercial[1]	102,783	2,545	2.5%
ATP[1]	163,063	4,968	3.0%
Miscellaneous[2]	6,571	320	4.9%
Total Pilots	**624,065**	**17,721**	**2.8%**
Flight Instructor[3]	110,431	3,591	3.3%
Remote Pilots[3]	158,980	5,271	3.3%

Notes: (1) Includes those with an airplane and/or a helicopter and/or glider certificate. Pilots under the Rotorcraft Only and Glider Only class certificates are included under their respective Private, Commercial, or ATP categories above. (2) Includes recreational and sport. (3) Not included in total. Source: FAA U.S. Civil Airmen Statistics, 2019

4.3.2. Maintenance Technicians

Maintenance technicians are a critical component of the continued safety of the aviation industry. Maintenance technicians must complete 18 months of practical work applicable to either an airframe or power plant rating. In order to earn both ratings, a technician must complete a certified aviation maintenance program or demonstrate 30 months of applicable experience. Each rating requires a combination of 400 hours of general coursework and 750 hours related to airframe or power plant technology.[20]

The educational coursework required for these ratings can be completed at several collegiate programs across the country that offer two-year technical degrees in aircraft maintenance. Illinois is home to five FAA-accredited maintenance schools including Lewis University, Lincoln Land Community College, Rock Valley College, Southern Illinois University, and Southwestern Illinois College. The FAA reports there are 7,166 mechanics certified in Illinois representing 2.6 percent of the total number of mechanics in the U.S (see **Table 4.7)**. Additional nonpilot airmen employment numbers for the total U.S. and Illinois, as well as percent of U.S. total, are also provided.

Table 4.7. Nonpilot Airmen by Category, U.S., Illinois, and Percent of U.S. Total

Category	U.S. Total	Illinois	Percent of U.S. Total
Dispatcher	18,038	994	5.5%
Flight Attendant	242,091	12,765	5.3%
Flight Engineer	31,543	977	3.1%
Flight Navigator	39	0	0.0%
Ground Instructor	66,354	2,177	3.3%
Mechanic	280,464	7,166	2.6%
Parachute Rigger	6,336	138	2.2%
Repair men	36,232	962	2.7%
Total Nonpilot Airmen	**681,097**	**25,179**	**3.7%**

Note: Data for flight engineers and flight navigators represent total active ratings held. Data for dispatchers, mechanics, repairmen, parachute riggers, and ground instructors represent total ratings issued to date. These ratings retain their validity and have been limited to those held by persons under 70 years of age. Source: FAA U.S. Civil Airmen Statistics, 2019

Similar to pilots, the aging of the workforce is a primary concern within the industry. The median age of aviation mechanics nationwide is 51 years, which is nine years older than the median age of the broader U.S. workforce.[21] Competition for qualified personnel is high because aviation mechanics sometimes choose to work outside of the aviation industry, The Aviation Technician Education Council (ATEC) estimates that 30 percent of those who finish an aviation maintenance training course accept employment in another industry.[22] Although the number of mechanics and enrollment in maintenance courses are down, one stakeholder from Southwestern Illinois College reported that the school's maintenance program is at-capacity—potentially signally a broader upward trend.

[20] https://www.faa.gov/mechanics/become/basic
[21] https://cavok.oliverwyman.com/our-expertise/insights/2018/jun/aviation-growth-is-outpacing-labor-capacity.html
[22] https://cavok.oliverwyman.com/our-expertise/insights/2018/jun/aviation-growth-is-outpacing-labor-capacity.html

4.3.3. Air Traffic Control Towers (ATCTs) Hours of Operation

FAA Air Traffic Services are critical to the safe and efficient movement of aircraft across the nation. Air Traffic Services control more than five million square miles of airspace in the U.S. and more than 24 million square miles over the oceans. The IASP TAC identified the limited hours of operation of some ATCTs in Illinois as an issue of pressing concern.

ATCTs support an airport's operational efficiency and safety, particularly at facilities with high demand and that support diverse aircraft traffic. While not an exact workforce shortage, facilities with only part-time ATCTs may lead to congestion issues in Illinois's busiest airspace. Hours of operation at air traffic control towers differ based on demand at the airport. Large hub commercial service airports like Chicago O'Hare International (ORD) and Chicago Midway International (MDW) airports have towers that are operational 24 hours a day, seven days a week. Airports with less demand operate ATCTs on a more limited schedule. For example, the ATCT at St Louis Regional (ALN) operates for 15 hours a day. **Table 4.8** summarizes information about all ATCTs in Illinois including average number of total operations recorded per day (2019), tower type, and number of hours the tower operates per day.

Table 4.8. Summary of Illinois Air Traffic Control Towers

Associated City	Airport ID	Average Ops / Day (2019)	Tower Type	Operating Hours / Day
Alton/St Louis	ALN	85	Contract	15
Bloomington/Normal	BMI	63	Contract	16
Cahokia/St Louis	CPS	266	FAA	15.5
Carbondale/Murphysboro	MDH	265	Contract	14
Champaign/Urbana	CMI	146	FAA	17
Chicago	MDW	636	FAA	24
Chicago	ORD	2,520	FAA	24
Chicago/Aurora	ARR	175	FAA	14
Chicago/Prospect Heights/ Wheeling	PWK	203	FAA	M-F: 16; S-S: 15
Chicago/Rockford	RFD	113	FAA	24
Chicago/Romeoville*	LOT	285	Contract	TBD
Chicago/Waukegan	UGN	117	Contract	12
Chicago/West Chicago	DPA	365	FAA	24
Decatur	DEC	96	Contract	16
Marion	MWA	57	Contract	12
Moline	MLI	93	FAA	17
Peoria	PIA	109	FAA	24
Springfield	SPI	71	FAA	16

Note: LOT's tower is under construction and plans to be operational by end of 2021*

Sources: FAA Air Traffic Activity System (ATADS), 2021; AOPA 2021

4.3.4. Next Steps

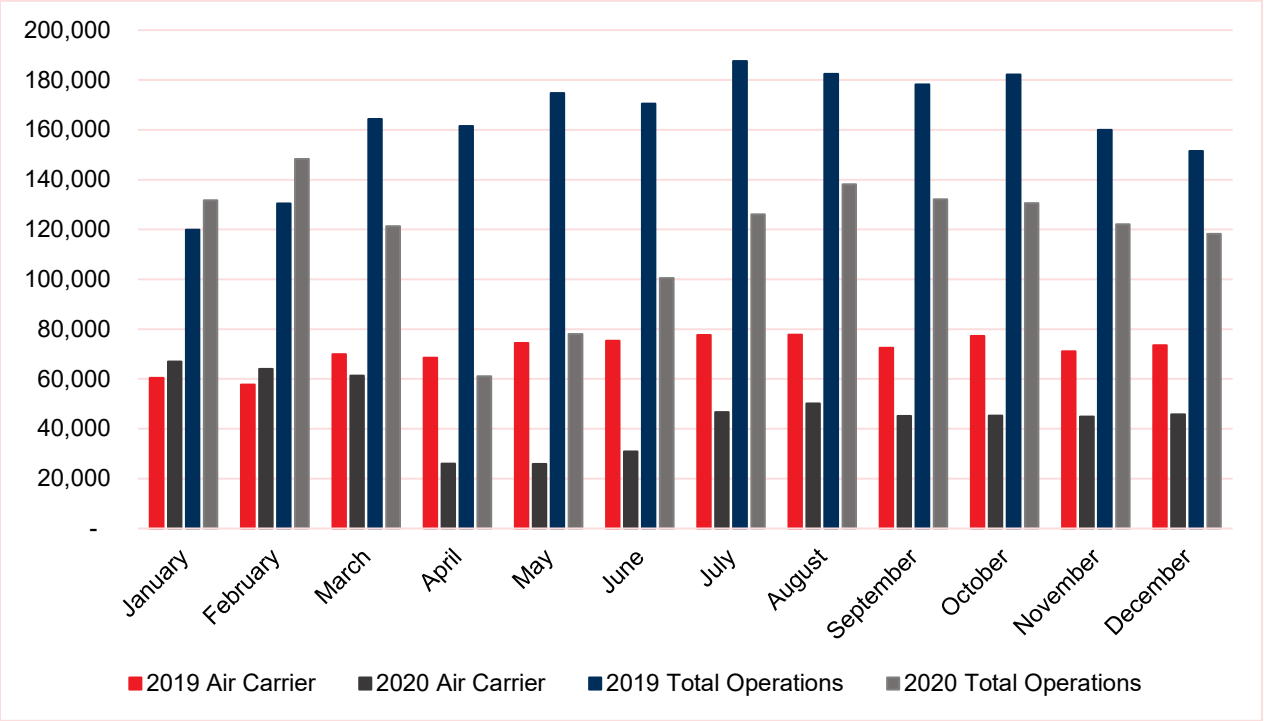
Although recent trends show positive growth in terms of student and matriculated pilots and COVID-19 has slowed the pace at which aviation workforce personnel are needed, the industry personnel shortage will continue to be a serious and persistent issue for years to come. In order to satisfy the need for skilled personnel in the aviation workforce, as well as increase operational safety by way of increased ATCT hours of operation, it is essential that Illinois works together with federal agencies, airports, educational institutions, and the private sector to address this growing challenge. Such partnerships will be required to develop strategic solutions to address the financial and other obstacles for students considering a career in the aviation industry.

4.4. COVID-19

After arriving in the U.S. in January 2020, high numbers of COVID-19 cases soon emerged across the country. In addition to being a public health crisis, COVID-19 has impacted the economy and air travel both domestically and across the globe. To slow the transmission of the virus, many companies have prohibited employees from traveling for business; countries have closed their borders; and some states have mandated stay-at-home/shelter-in-place orders, closed non-essential businesses, and discouraged all non-essential travel. With commercial passenger travel plummeting, some U.S. airports have closed entire concourses, gates, and runways to reduce operating expenses and allow some staff to work from home to minimize the risk of exposure.

Figure 4.7 shows the number of air carrier and total operations occurring at all towered airports in Illinois in 2019 and 2020 by month. In January and February 2020, prior to the outbreak of the virus in the U.S., air carrier and total operations exceeded 2020 figures by 10 to 14 percent. That trend reversed in March, with air carrier operations dropping by 12 percent compared to that same month in 2019 and total operations dropping by 26 percent. The month-over-month percent difference fell to its nadir in May 2020, with air carrier operations 65 percent less than the previous year and total operations at 55 percent less. Trends began to improve somewhat in July. Air carrier operations between July and December 2020 were between 37 and 41 percent lower than 2019. Total operations in 2020 hovered between 22 and 28 percent less than 2019 for each month. All monthly numbers are presented in **Table 4.9**.

Figure 4.7. Air Carrier and Total Operations at Towered Airports in Illinois by Month, 2019 - 2020



Source: FAA Air Traffic Activity System (ATADs), January 2021

Table 4.9. Air Carrier and Total Operations at Towered Airports in Illinois by Month, 2019 - 2020

Month	Air Carrier Operations			Total Operations		
	2019	2020	% Difference	2019	2020	% Difference
January	60,448	67,045	11%	119,913	131,720	10%
February	57,696	63,993	11%	130,494	148,283	14%
March	69,917	61,367	-12%	164,349	121,273	-26%
April	68,584	25,971	-62%	161,557	61,088	-62%
May	74,424	25,954	-65%	174,692	78,084	-55%
June	75,395	30,858	-59%	170,479	100,482	-41%
July	77,602	46,760	-40%	187,580	126,067	-33%
August	77,839	50,149	-36%	182,403	138,188	-24%
September	72,572	45,123	-38%	178,233	132,119	-26%
October	77,308	45,258	-41%	182,224	130,571	-28%
November	71,073	44,853	-37%	159,954	122,143	-24%
December	73,485	45,793	-38%	151,553	118,239	-22%
Total Annual	**856,343**	**553,124**	**-35%**	**1,963,431**	**1,408,257**	**-28%**

Source: FAA ATADs, January 2021

At the national level, total domestic airline capacity declined about 70 percent between 2019 and 2020–a reduction nearly four times greater than after the September 11 attacks and six times greater than after the 2008–2009 financial crisis.[23] As a result, the COVID-19 pandemic has caused unprecedented losses in global airline revenues, with analysts reporting $110 billion in lost revenue to among the world's top airlines during the first three quarters of 2020 alone.[24] **Table 4.10** provides the revenue losses for three U.S. mainline carriers due to COVID-19 from January through September 2020, which totaled $63.9 billion during this nine-month period. Commercial service carriers continue to operate "in the red" at the time of this writing in February 2021.

Table 4.10. Airline Revenue Lost to COVID-19 (Q1 – Q3, 2020)

Airline	Lost Revenue
American Airlines	$21,100,000,000
Delta Air Lines	$22,400,000,000
United Airlines	$20,400,000,000

Source: American Journal of Transportation, 2020

To mitigate losses to the industry and save jobs, the CARES Act allocated $10 billion to support continued operations at NPIAS airports. The CARES Act funded 100 percent of all AIP grants awarded in FY 2020, relieving state and local sponsors from having to provide matching contributions. In addition, airlines and other aviation-related businesses were eligible to receive funding to support continued operations and employ staff despite significant revenues losses. A second round of COVID relief funding was signed into law on December 27, 2020, which provided an additional $2 billion in funding for airports. This second round of funding allocates $45 million in funding for GA airports. These funds can be used for costs related to operations, personnel, cleaning, sanitization, janitorial services, combating the spread of pathogens in airport facilities, and debt service payments.[25]

It is important to note that GA airports have been impacted far more varyingly than commercial service facilities, with some sectors even witnessing record-high numbers of operations. Some recreational pilots have benefitted from low fuel prices coupled with few other recreational alternatives due to COVID-related shutdowns and social distancing recommendations. Pilots may have more time to fly as companies move to a work-from-home model. Airports too have reported upticks in corporate/business aviation. With many companies hesitant to fly employees and clients via scheduled commercial service, the relative control and isolation offered by corporate/business aviation is a welcome and viable alternative. Yet like many impacts of COVID-19, precisely how and to what extent the virus has impacted GA airports is unknown. Full calendar year data is unavailable from many sources at the time of this writing, and activity counts at non-towered airports are inherently difficult to capture in any year. As such, much of what is known about the impacts of COVID-19 at most GA airports relies on anecdotal information provided by airport managers or FBOs or by comparing fuel sales over time. Despite these challenges, it is vitally important that state and federal policymakers continue to monitor GA activity to ensure airports and aviation-related businesses continue to remain viable and operational through the pandemic.

[23] https://www.mckinsey.com/industries/travel-logistics-and-transport-infrastructure/our-insights/for-corporate-travel-a-long-recovery-ahead
[24] https://ajot.com/news/article/worlds-largest-airlines-lost-110bn-in-ytd-revenue
[25] https://www.aopa.org/news-and-media/all-news/2020/december/23/congress-funds-aviation-in-combined-bill

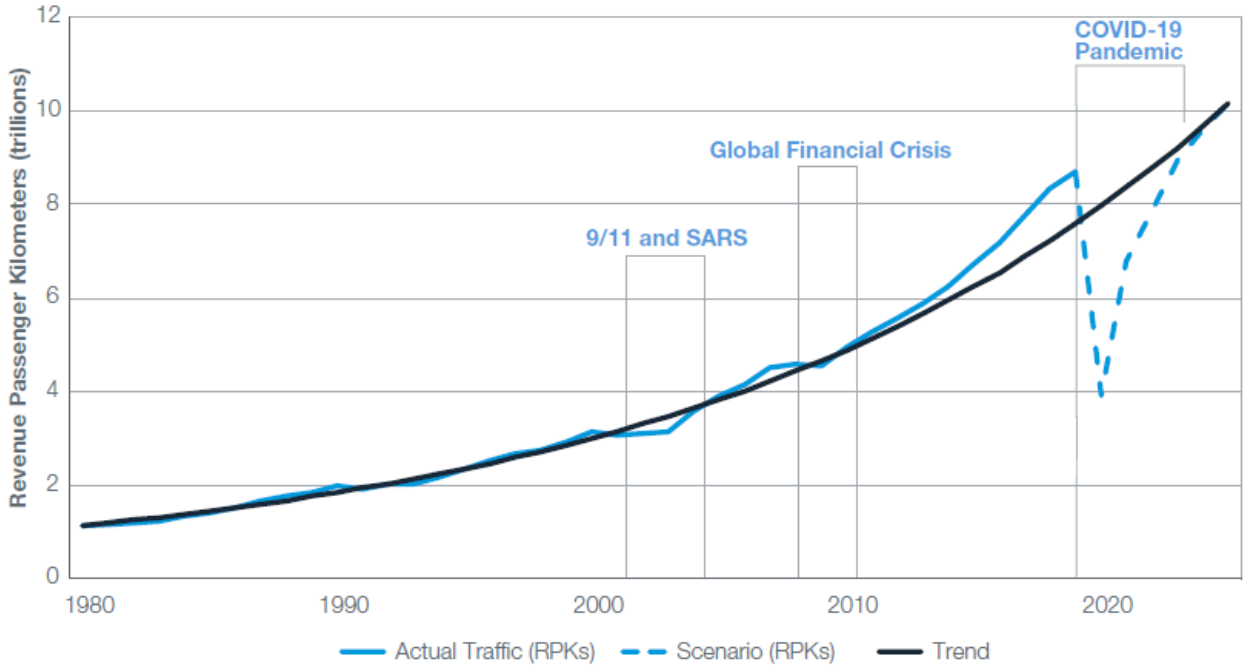
4.4.1. Next Steps

At the time of this writing in January 2021, COVID-19 vaccines are being delivered nationwide, with healthcare workers, educators, emergency responders, and vulnerable populations already receiving the shot in many states. Although these vaccines are promising and play an invaluable role in ending the pandemic, the timeline for widespread immunity is unknown. Despite the uncertainty, passengers are returning to the skies. The Transportation Security Administration (TSA) screened 1,284,599 passengers on December 27, 2020, the highest recorded number of passengers since the COVID pandemic was announced in March.[26] The record-setting number of passengers is promising; however, the total still represents less than half of the number of passengers screened on the same day in 2019. Until the virus has been eradicated or considered totally under control, airport operators and airlines must continue to implement all strategies to mitigate threats associated with virus exposure. ACRP Report 91: *Infectious Disease Mitigation in Airports and on Aircraft* offers best practices associated with reducing the transmission of infectious diseases such as COVID-19.

While challenges undoubtedly lie ahead, analysts generally expect a three- to five-year recovery period before air travel restores to pre-COVID levels. As the COVID-19 pandemic has severely impacted air travel and demand for passenger service, there are many unknowns regarding how the industry may recover. However, it is important to remember that other historical events have disrupted air travel in the past. In all cases, demand has returned at higher rates subsequent to each occurrence. The *Boeing Commercial Market Outlook 2020-2039* observes that, “The fundamentals that have driven air travel the past five decades and doubled air traffic over the past 20 years remain intact. While aviation has seen periodic demand shocks since the beginning of the Jet Age, our industry has recovered from these downturns every time throughout its history.”[27] This trend is illustrated in **Figure 4.8**, which shows the recovery of air travel following other major world events in the early decades of the 21st century.

[26] https://www.axios.com/tsa-pandemic-sunday-screened-ca7d90fd-9446-4862-b617-57a935517fc8.html
[27] Boeing (October 2020). Commercial Market Outlook 2020-2039. Available online at https://www.boeing.com/resources/boeingdotcom/market/assets/downloads/2020_CMO_PDF_Download.pdf (accessed October 2020).

Figure 4.8. Long-term Air Travel Growth Trends in Consideration of Major World Events



Sources: ICAO scheduled traffic through 1999 / 2000-2019E IATA stats / 2020F IATA December 2019 as presented by the Boeing Commercial Market Outlook 2020-2039

The COVID-19 issue is related to nearly all other IASP issues, particularly as it relates to revenue generation and overall aviation activity including the Aviation Work Force Shortage, Fuel Availability, Growth of E-Commerce, Infrastructure, and Runway Condition. The ripple effects of COVID-19 have permeated through all levels of aviation activity as well as ancillary markets reliant on aviation and travel.

4.5. Drones and Commercial Space

Rapid technological advances continue to change the landscape of aviation, with UAS and commercial exploration existing on the cutting-edge. Both technologies offer promising advancements for enterprise and society at large with expectations for broad commercial, military, research, and other applications. Unmanned aerial vehicles (UAV) are already being used by state agencies including the Illinois State Police and may be adopted by other state agencies in the coming years. Adoption must be carefully planned and executed to avoid any negative impacts on airports and the NAS. Each of these technologies is explored in more detail in the sections below.

4.5.1. UAS

The idea of unmanned aircraft arose over 100 years ago, with U.S. and British forces testing and developing the earliest prototypes during World War I. While the history of UAS is extensive, this technology has only recently moved from primarily military applications to widespread commercial, recreational, research-oriented, and other government use. UAS are now deployed for a wide array of tasks including aerial spraying, monitoring environmentally sensitive areas, providing visual feedback to emergency response crews, aerial firefighting, and aerial surveillance and photography. Many state government agencies now deploy UAV to conduct bridge and port inspections, and some airports are testing the viability of using the technology to remotely monitor pavement conditions.

As the number of UAV deployed continues to grow, so too does the threat of midair collisions with traditional manned aircraft. Several midair collisions have already occurred, and near-misses are regularly reported—although no pilots or passengers have been injured to date. Between April 2019 and June 2020, 99 drone sightings were reported to the FAA at Illinois airports.[28] To promote the safe integration of UAV into the NAS, the FAA issued updated guidance in May 2019 governing the usage of recreational vehicles.[29] These policies state that UAV must be kept within visual life of sight and recreational vehicles of any size must be registered with the FAA. Recreational users must fly at or below 400 feet when in uncontrolled (i.e., Class G) airspace and require users to obtain preauthorization before flying in controlled airspace (i.e., Class B, C, D, and E). Preauthorization is available through the FAA's DroneZone Program or from airports with Low Altitude Authorization and Notification Capability (LAANC). LAANC is available at 537 air traffic control facilities and 726 airports in the U.S., including 20 airports in Illinois (see **Table 4.11**). Additional guidance is provided in in FAA Advisory Circular (AC) 91-57B, *Exception for Limited Recreational Operations of Unmanned Aircraft*.

Table 4.11. Illinois Airports Participating in the LAANC

Associated City	Airport Name	FAA Identifier
Alton/St. Louis	St Louis Regional	ALN
Bloomington/Normal	Central Illinois Regional Airport at Bloomington-Normal	BMI
Cahokia/St. Louis	St Louis Downtown	CPS
Carbondale/Murphysboro	Southern Illinois	MDH
Champaign/Urbana	University of Illinois-Willard	CMI
Chicago	Chicago Midway International	MDW
Chicago	Chicago O'Hare International	ORD
Chicago/Aurora	Aurora Municipal	ARR
Chicago/Prospect Heights/Wheeling	Chicago Executive	PWK
Chicago/Rockford	Chicago/Rockford International	RFD
Chicago/Waukegan	Waukegan National	UGN
Chicago/West Chicago	Dupage	DPA
Decatur	Decatur	DEC
Galesburg	Galesburg Municipal	GBG
Marion	Veterans Airport of Southern Illinois	MWA
Moline	Quad City International	MLI
Mount Vernon	Mount Vernon	MVN
Peoria	General Downing-Peoria International	PIA
Quincy	Quincy Regional-Baldwin Field	UIN
Springfield	Abraham Lincoln Capital	SPI

Source: FAA LAANC (updated September 24, 2020)

[28] https://www.faa.gov/uas/resources/public_records/uas_sightings_report/
[29] Any use of UAS for commercial purposes must be conducted under 14 Code of Federal Regulations (CFR) Part 107 and/or other applicable regulations including Part 91, Part 135, and Part 137.

The FAA issued additional rules on December 28, 2020 that require the Remote Identification (Remote ID) of UAV and to allow for the operation of small vehicles over people and at night under certain conditions. Operators are now required to install equipment on their UAV that broadcasts out identifying information. If operators do not have this equipment, operations can be conducted at FAA-recognized identification areas (FRIAs). FRIAs are now the only areas where UAV may operate without broadcasting Remote ID messaging elements.[30] In addition to these federal rules, communities may enact local restrictions governing the usage of UAS. Nineteen percent of airports in Illinois reported having a formal policy regarding UAS during IASP data collection.

With nearly 23,800 drones registered in Illinois and no sign of popularity abating, the potential for conflicts between UAVs and traditional manned aircraft continues to grow. The FAA is continuing to enact stricter regulations, and recreational users will soon be required to pass an aeronautical knowledge test and carry proof of test passage. Unfortunately, there are reports that many UAV operators do not know or follow existing rules, and both airports and traditional pilots are unfamiliar with federal mandates. The previous FAA rule stated that UAV could be operated within five miles of an airport with prior airport permission. While no longer valid, this rule is still cited, and many airports believe they have the authority to govern UAV usage within their vicinities. Further, with UAVs already being deployed for remote package delivery, the potential for conflict will likely grow until a cohesive and comprehensive strategy is developed, implemented, and enforced nationwide. This will require collaboration between commercial, recreational, governmental, and other UAV operators; airports; and traditional airspace users (i.e., pilots). Local policymakers and land use planners may also have a role in enacting zoning regulations addressing future “drone ports” from which this emerging technology is launched. This issue may continue to grow in complexity with the emergence of Urban Air Mobility (UAM) (also known as Advanced Air Mobility [AAM]). UAM is the evolution of UAV technologies to transport passengers short distances within urban areas. UAM promises to relieve ground congestion but introduces new questions including but not limited to their safe integration into the existing National Airspace System (NAS), land use compatibility, and nexus between “traditional” modes of transportation with cutting-edge innovations.

4.5.2. Commercial Space

Space has fascinated humankind since the dawn of our species, with space exploration becoming a reality as an outcome of the “Space Race” beginning in the 1950s. Once solely within the realm of governments, private companies have now entered spaceflight. Private companies began launching satellites into space as early as the 1960s. Fifty years later, SpaceX became the company to launch and recover from orbit a privately developed spacecraft in December 2010. Today, SpaceX is joined by leading aerospace companies such as Blue Origin, Virgin Galactic, Boeing, Northrop Grumman, and Lockheed Martin in producing groundbreaking commercial space technologies. In May 2020, SpaceX became the first private company to launch a crew into space and visit the International Space Station.

Private spaceflight is a rapidly growing field, with new players and established companies making great strides in turning the commercialization of space from science fiction to reality. According to a recent report by Morgan Stanley, the global space industry is expected to generate revenue of at least $1.1 trillion in 2040, up from the current $350 billion.[31] The rapid pace at which the space industry is

[30] https://www.faa.gov/uas/getting_started/remote_id/
[31] https://www.morganstanley.com/ideas/investing-in-space

developing points to an equally growing need for locations from which to operate. Known as spaceports, the location of a launch site is primarily determined by access to useful orbits and public safety. Launch sites are typically built as far away as possible from population centers in case of a catastrophic failure. Many launch sites are built close to bodies of water to minimize risks to people and property on the ground should failure occur. There are currently 14 operating non-Federal spaceports in the U.S., as shown in **Table 4.12.**

Table 4.12. Non-federal Spaceports in the U.S.

Facility Name	City	State
Blue Origin Launch Site	Van Horn	Texas
Cape Canaveral Spaceport	Cape Canaveral	Florida
Cecil Field Spaceport	Jacksonville	Florida
Colorado Air and Space Port	Watkins	Colorado
Houston Spaceport	Houston	Texas
Mid-Atlantic Regional Spaceport	Wallops Island	Virginia
Midland Spaceport	Midland	Texas
Mojave Air and Spaceport	Mojave	California
Oklahoma Spaceport	Burns Flat	Oklahoma
Pacific Spaceport Complex	Kodiak	Alaska
Space Coast Regional Airport	Titusville	Florida
Spaceport America	Truth or Consequences	New Mexico
SpaceX Launch Site McGregor	McGregor	Texas
SpaceX Launch Site Boca Chica	Boca Chica	Texas

Source: FAA, 2020

States, cities, and airports across the country are discussing the possibility of and applying for FAA spaceport licenses due to the revenue that private space companies can provide for the airport and surrounding community. Although there are currently no spaceports in Illinois, the rapid rate at which these companies are expanding means that more spaceport facilities are likely to be constructed in the future. Issues can arise when these companies decide to build at established airports due, in part, to the amount of room facilities typically require. In fall 2019, Flight Safety International announced it would build a 125,000-square foot aviation training facility at Ellington Field in Houston. Although Ellington Field had the room to accommodate such a large facility, many airports do not. Companies building large-scale facilities on airport property can lead to serious capacity issues and prohibit further development.

As spacecraft launches become more frequent, airspace issues may also arise, In February 2018, SpaceX launched the Falcon Heavy for the first time. The launch took place at the Kennedy Space Center on Merritt Island, Florida. SpaceX was given a launch window from 1:30 PM to 4:00 PM. The FAA shutdown the airspace near the launch site during the launch window. As a result, flights around the Orlando area were disrupted. The launch resulted in approximately 563 flight delays, and planes flew an

additional 34,841 nautical miles (nm) as a result.[32] The severe capacity and airspace issues likely to arise from commercial space operations could pose a significant risk to the operational capacity of the Illinois aviation system.

4.5.3. Next Steps

The projected increase in UAS activity in the recreational, commercial, and government sectors warrants further study by IDOT. The state passed an act to create the UAS Oversight Task Force to provide input on creating comprehensive rules governing the operation and use of UAS technologies within the state. State regulators should particularly focus on combatting illegal UAV operations near commercial service airports, which are at highest risk for large-scale disasters should a midair collision occur. It is important to note that this technology remains on an upward trajectory, poised to gain more popularity as technology, regulations, and commercial applications become better aligned. As one stakeholder noted, “the state needs to embrace this emerging technology.”

The magnitude and complexity of space transportation will likely place new demands on aviation infrastructure and the capacity of the NAS. As space vehicles transition through airspace primarily regulated for traditional aircraft, new policies, regulations, and procedures are necessary to provide for safe and efficient operations of both “historic” and emerging technologies. Should the potential for spaceport development arise in Illinois, IDOT should consider the implications from a systemwide perspective to understand how the capacity of the state’s airports and airspace could be affected.

In addition to UAS and the privatization of space, the aviation industry is burgeoning with other cutting-edge technologies promising a future where flight is cheaper, more sustainable, and/or faster than ever before. An acute and industry-wide focus on alternative propulsion systems has been catalyzed by increasing concerns about the rising and volatile cost of fossil fuels, a renewed focus on environmental sustainability, and other enabling trends. This includes the electrification of conventional aircraft as well as the development of new vehicles configured for vertical take-off and landing (eVTOL) most typically associated with Advanced Air Mobility (AAM). Hydrogen is also being extensively researched for its potential to power future zero-emissions aircraft, with many industry analysts considering hydrogen to be the most promising net-zero aviation technology due its extremely high energy density and low weight. Sustainable aviation fuel (SAF) is already a reality, with supply chain logistics and costs being the only obstacles to widespread adoption. SAF is designed to be “drop-in ready,” which means it can be used by aircraft designed to use Jet A fuel without modification.

Supersonic aircraft are also making a resurgence in civilian aviation, with the latest technologies promising to be quieter and less fuel-intensive than their predecessors. Industry leaders at the Aerion Corporation and Boom Supersonic assert their aircraft will shave hours off transoceanic journeys. Both companies are working on solutions to reduce the fuel burn and noise impacts of supersonic flight.

The application of all these technologies vow to enhance the user experience and address some of the key issues that have historically plagued the transportation industry such as noise, greenhouse gas emissions, and an overwhelming dependance on fossil fuel. Whether traveling within urban environments via AAM or across the globe on a supersonic aircraft, future scientific discoveries may open a range of new possibilities in terms of moving through space by air. Like all technologies discussed in this section,

[32] https://www.alpa.org/-/media/ALPA/Files/pdfs/news-events/white-papers/white-paper-aviation-space.pdf

the widespread adoption of cutting-edge aviation applications necessitates a careful, coordinated, and intentional approach between public and private partners at every level. Careful planning will help mitigate impacts to existing system while supporting society's ability to maximize benefits such as improved mobility; lower costs; enhanced environmental sustainability; and reduced travel time at local, regional, and global scales.

4.6. FBO Pricing Transparency

FBOs offer a variety of services and amenities to support aircraft and their pilots and passengers. This can include fuel sales, aircraft parking, pilot and passenger lounges, flight planning areas, food and beverage options, Wi-Fi access, courtesy or rental cars, restrooms, and more. FBOs are either privately owned and operated or run by the airport sponsor. Many FBOs generate the largest portion of their revenue via fuel sales, which provide limited profit margins. Because fuel sales do not generate significant profits and to ensure that travelers do not use FBO facilities for free if not purchasing fuel, FBOs often charge "ancillary" fees for the use of their services and facilities. The fees charged by FBOs can vary depending on the location of the airport, scope of services offered, and amenities present. While these fees vary significantly, many pilots cite one common issue: lack of transparency. In some cases, pilots are unaware of fees being levied until he or she receives the final bill. In some cases, FBOs charge landing and ramp fees that are unknown to users until the landing has already taken place. This leaves little room for negotiation and can ultimately result in conflicts or lack of trust between FBO operators, pilots, and the airport sponsor. Users who feel deceived by an FBO may decide to conduct operations elsewhere and encourage other pilots to do the same via networking groups and online forums. This further reduces revenues to the FBO and airport sponsor and may lead to other on-airport tenants to move operations to an alternative airport with better relationships with the pilot community.

Members of the IASP TAC identified FBO pricing transparency as an issue across Illinois. Addressing this concern will improve the relationship between all parties and encourage pilots to return to an airport. This, in turn, generates additional revenues for the FBO and airport sponsor through sales that do occur, as well as visitor trips to nearby communities where additional economic impact is generated due to spending at local restaurants, retail shops, and other establishments.

4.6.1. FBO Fees

FBOs are a key component of the GA community and often provide critical aircraft support services for aviators. Many FBOs in the U.S. and in Illinois are small businesses who are active partners with the pilots and owners who depend on the services they provide. The website Airsport.com lists 74 FBOs operating at 51 airports in the state.[33] While companies such as Million Air and Signature Flight Support operate at airports across the U.S., many others operate at a limited number of airports within a specific region or have only one location. Unfortunately, not all companies follow best business practices—causing mistrust, frustration, and ripple effects that can spiral through the intricate GA aviation network. One stakeholder associated with private business travel identified "excessive fees imposed by airports and FBOs" is a top threat to the Illinois aviation system.

[33] http://www.airsport.com/fbo2.ihtml?state=IL&stname=Illinois

In one recent example, complex and expensive pricing structures at Signature Flight Support at Waukegan National Airport (UGN) led AOPA to file an FAA Part 13 complaint against the FBO.[34] Because the ramp was under the exclusive control of Signature Flight Support, AOPA alleged the company was preventing or restricting reasonable public access to the airport and surrounding community. One pilot received a $236 charge for parking a 4,000-pound aircraft on the ramp for two hours, which Signature reduced to $90 when he complained.[35] The FBO's reputation within the GA community had led some pilots to avoid Waukegan National Airport entirely. One pilot made a stop elsewhere after learning it would cost $55 to use the restroom unless he purchased a minimum of 10 gallons of fuel.[36] The AOPA complaint against Signature Flight Support catalyzed a number of changes at Waukegan National Airport. Airport management has since communicated the availability of free ramp parking for transient aircraft and a pedestrian gate that allows pilots and passengers to bypass the FBO entirely. Signature Flight Support also lowered the price of 100LL AvGas.[37]

4.6.2. Next Steps

To combat the problem of a lack of FBO pricing transparency AOPA began published FBO fees in the AOPA Airport Directory in June 2019. Pilots can now easily find FBO prices for all the items offered by FBOs at airports throughout the country. The directory lists 36 common fee types including deicing, ground power units (GPUs), aircraft handling, infrastructure, overnight aircraft parking, lavatory, security, and facility use. AOPA's Airport Directory is the first step toward a one-stop portal for pilots and FBOs in the quest for fee transparency at airports. AOPA has begun an industry-wide outreach campaign to FBOs across the country to encourage operators to publish their fees in the directory. AOPA encourages FBOs to voluntarily and proactively update their fees. As of this writing, 86 FBOs at Illinois system airports have FBO fuel and other fees published in the AOPA Airport Directory.[38]

Additionally, AOPA has developed "GA Industry Recommended Best Practices" for FBOs to provide the highest level of customer service and transparency.[39] The recommendations state that all FBOs should adopt the following communications best practices:

- Provide description of all available services and associated prices, fees, and charges
- Information should be posted online in a user-friendly format with sufficient clarity to allow pilots to make informed decisions
- Information should be made available as expeditiously as feasible
- Provide contact information so pilots can contact FBOs prior to arrival

Adopting these best practice and publishing prices, fees, and charges in the AOPA Airport Directory will help FBOs make major strides towards transparent pricing structures and improved relations with the GA community. Additionally, visibility increases competition amongst FBOs—leading to lower prices and increased airport activity levels. Airports will likely benefit from increased aircraft traffic, generating higher revenues and visitor spending economic impacts within their communities. To support these initiatives,

[34] https://www.aopa.org/news-and-media/all-news/2017/august/28/aopa-files-official-complaints-over-fbo-fees
[35] https://www.aopa.org/news-and-media/all-news/2017/august/28/aopa-files-official-complaints-over-fbo-fees
[36] https://www.aopa.org/news-and-media/all-news/2017/august/28/aopa-files-official-complaints-over-fbo-fees
[37] https://www.aopa.org/news-and-media/all-news/2017/december/21/waukegan-improves-transient-airport-access
[38] https://www.aopa.org/destinations
[39] https://www.aopa.org/-/media/Files/AOPA/Home/Advocacy/know-before-you-go/Know-Before-You-Go-Best-Communications-Practices-FBO.pdf

IDOT could consider partnering with AOPA and airports to encourage FBOs voluntary participation in these programs. IDOT can also incorporate transparent pricing best practices into grant assurances to ensure open and equitable access to Illinois's GA airports.

4.7. Fuel

Fuel availability is frequently a driving factor for pilots and aircraft owners when deciding where to base their aircraft or conduct transient operations. Fuel sales, either through an FBO or self-serve station, is one of the primary revenue streams at many airports. Airports that do not sell fuel typically have less access to revenue than those that do. Illinois recently enacted changes to fuel tax legislation to comply with FAA regulations and guidelines, which has effectively raised the cost of fuel. This issue, as well as a lack of 24-hour fuel availability across Illinois, were cited as top issues affecting aviation in the state.

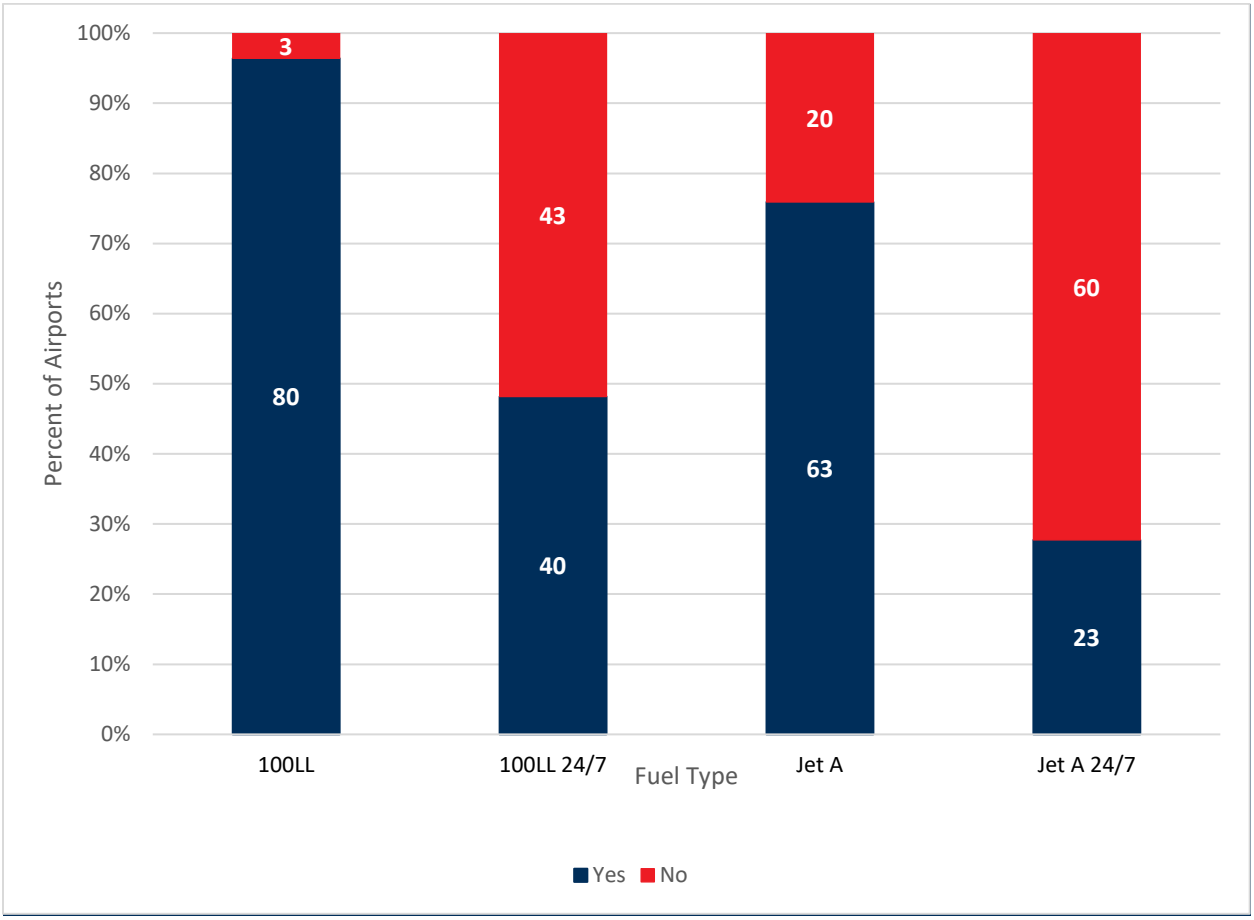
4.7.1. Fuel Availability

Twenty-four-hour fuel facilities offer an additional layer of safety for pilots who fly outside of normal business hours. This is particularly important for medical flight operators, corporate/business aviators, search-and-rescue providers, and other aviators whose schedules rarely align with an 9:00 AM – 5:00 PM business day. Additionally, 24-hour fuel allows an airport to generate revenue after FBO or airport operations staff have left for the day. In fact, the difference in revenue generated between airports with and without 24-hour fuel availability can be quite large. For example, one system airport that does not offer 24-hour fuel reported $76,056 in 2019 fuel sales of 100LL and Jet A combined. A peer facility with comparable operations and 24/7 fuel reported $157,914 in 100LL and Jet A fuel sales over that same period.

Twenty-four-hour fuel can be offered by a self-service station or offered on a call-out basis. Call-out services are provided when a pilot calls an on-duty staff member to the airport outside of normal business hours. While valuable if an aircraft has run out of fuel, call-out service can result in significant delays as the pilot waits for a staff member to arrive. Furthermore, delays can literally be a matter of life-or-death for emergency responders and air ambulance operators. In fact, one air ambulance operator in Illinois reported that a lack of 24/7 fuel facilities in Illinois has caused him to fly great distances to refuel during nighttime operations. In some cases, he is forced to fly out-of-state to access fuel.

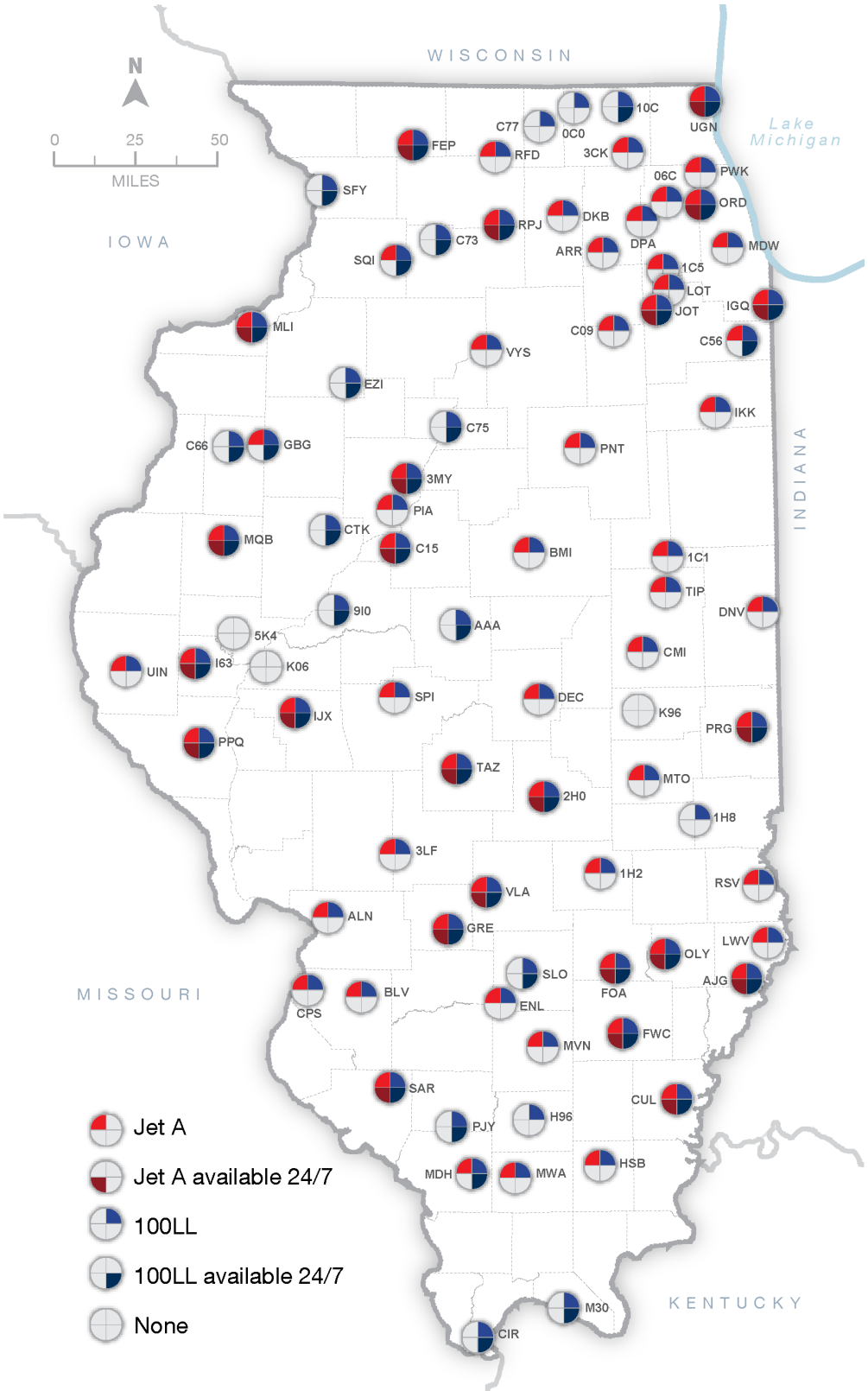
To better understand the pervasiveness of this issue, the IASP evaluated availability of 100LL, Jet A, or both fuel types at airports across the state. This analysis looked specifically at 24/7 fuel available via a self-service credit card reader. As shown in **Figure 4.9** this analysis revealed that while 96 percent of airports offer 100LL, only 48 percent of airports provide 24/7 access via credit card reader. Seventy-six percent of airports offer Jet A during business hours, while just 27 percent of airports offer Jet A 24/7 via self-service credit card reader. Fuel availability at Illinois airports is depicted in **Figure 4.10**.

Figure 4.9. Availability of 100LL and Jet A Fuel



Note: Data labels indicate number of airports.
Sources: IASP Inventory Form, 2020; Kimley-Horn, 2020

Figure 4.10. Fuel Availability at Illinois System Airports



Sources: IASP Inventory Form, 2020; Kimley-Horn, 2020

It is important to note that all airports do not require 24/7 fuel to provide adequate access for pilots, and a certain subset of facilities can provide 24/7 without impacting the safety of the airport system. To identify if specific geographic gaps may exist within Illinois, the IASP identified airports without access to 24/7 100LL within 30 nautical miles (NM), 24/7 Jet A within 50 NM, and airports that do not have access to either fuel type within these thresholds. Of the 43 airports without 24/7 100LL, seven facilities are farther than 30 NM from another airport that provides this service. Of the 60 airports that do not provide 24/7 Jet A, two facilities are farther than 50 NM from another airport that does provide this service. No airports are outside of the 30 NM threshold for 24/7 100LL and the 50 NM threshold for 24/7 Jet A. Airports that may represent in a gap in Illinois airport system in terms of access to 24/7 fuel are listed in **Table 4.13**.

Table 4.13. Airports without Access to 24/7 100LL Within 30 NM or Jet A Within 50 NM

Associated City	Airport Name	FAA ID	Fuel Type (NM Threshold)	
			100LL (30 NM)	Jet A (50 NM)
Alton/St Louis	St Louis Regional	ALN	✓	
Cahokia/ St Louis	St Louis Downtown	CPS	✓	
Champaign/ Urbana	University of Illinois-Willard	CMI	✓	
Danville	Vermilion Regional	DNV	✓	
Paxton	Paxton	1C1	✓	
Pontiac	Pontiac Municipal	PNT	✓	
Rantoul	Rantoul National Aviation Center-Frank Elliott Field	TIP	✓	
Cairo	Cairo Regional	CIR		✓
Metropolis	Metropolis Municipal	M30		✓

Sources: IASP Inventory Form, 2020; Kimley-Horn, 2020

4.7.2. Fuel Tax

Many aviation stakeholders identified high aviation fuel tax rates as one of the most significant constraints on the future of aviation in Illinois. Like many states, Illinois levies taxes on 100LL and Jet A aviation fuels. Taxes on aviation fuel sales have been issued by the State of Illinois at a rate of 6.25 percent in sales tax and $0.003 per gallon excise tax for both 100LL and Jet A fuel. The Illinois tax on fuel sales is coupled with other state-mandated taxes, such as those on underground fuel storage tanks at a rate of $0.003 per gallon stored, and an environmental impact fee of $60 per 7,500 gallons sold. As shown in **Table 4.14**, Illinois has the highest state sales tax levied against aviation fuel in the region.

Table 4.14. State Fuel Tax Rates (2020)

State	100LL AvGas	Jet A
Iowa	Excise: $0.08/gallon	Excise: $0.05/gallon
Illinois	Excise: $0.003/gallon Sales: 6.25%	Excise: $0.003/gallon Sales: 6.25%
Indiana	Excise: $0.1/gallon	Excise: $0.1/gallon
Kentucky	Excise: $0.23	Sales: 6.0%
Missouri	Excise: $0.09	Sales: 4.225%
Wisconsin	Excise: $0.06	Excise: $0.06

Sources: Energy Information Administration, 2020; AOPA, 2021

Additionally, local taxes can also be levied on top of state taxes provided those funds are used to support aeronautical activities. Local taxes range from 0 to 4.25 percent depending on location. Illinois's high fuel tax rate and associated higher costs of flying is of particular concern for GA airports that border other states. Some neighboring states have lower tax rates or no taxes on aviation fuel, driving pilots to fly to neighboring jurisdictions in other states to refuel. The manager of Cairo Regional (CIR) noted that one of the biggest issues facing the airport is "[t]rying to maintain competitive fuel prices with surrounding states." These concerns were echoed by Vermillion Regional (DNV), whose manager stated, "[b]eing so close to the Indiana border we are sometimes at a disadvantage with general business policy, such as taxes on fuel…as compared to Indiana."

4.7.3. Next Steps

State and local government play an active role in determining the tax rate for fuel sales, and as such can change the tax rate to be at a rate that is competitive with surrounding states while still maximizing revenue from the taxes. As one step in the right direction, Illinois Public Act 101-604 (effective January 1, 2021) exempted aviation fuel from all other local retailers' occupational taxes imposed by a local unit of government and administered by the Illinois Department of Revenue.[40] This effectively reduced local taxes on aviation fuel in three municipalities and four counties, as shown in **Table 4.15**. While taxes are still higher than some surrounding jurisdictions, these changes do reduce the taxes for pilots flying within these jurisdictions.

Table 4.15. Summary of Sales Tax Rate Changes for Aviation Fuel (Effective January 1, 2021)

Jurisdiction	Combined Rate Ending December 31, 2020	Rate Change	New Rate Effective January 1, 2021
Municipalities			
Galesburg			
North Seminary Street Business District	8.25%	-1.00%	7.25%
Outside Business District	7.25%	No change	7.25%
Mattoon			
Broadway East Business District	7.75%	-1.00%	6.75%
I-57 East Business District	7.75%	-1.00%	6.75%
South Route 45 Business District	7.75%	-1.00%	6.75%
Outside Business Districts	6.75%	No change	6.75%
Taylorville			
Taylorville Business District[1]	8.00%	-1.00%	7.00%
Outside Business District	7.00%	No change	7.00%
Counties			
Adams County	6.50%	-0.25%[1]	6.25%
Effingham County	6.50%	-0.25%[1]	6.25%
Macon County	6.75%	-0.50%[1]	6.25%
Peoria County	6.75%	-0.50%[1]	6.25%

Note: (1) This tax rate change is imposed countywide in both the incorporated and unincorporated areas of the county. The new combined rate listed is the rate in the unincorporated area of the county and in any municipality that does not have a locally imposed sales tax. Source: Illinois Department of Revenue, 2020

[40] https://www2.illinois.gov/rev/research/publications/bulletins/Documents/2021/FY2021-09.pdf

It is also important to note that all taxes imposed on aviation fuel must be used for aviation-related purposes in accordance with the FAA's Policy Concerning the Use of Airport Revenues, Proceeds from Taxes on Aviation Fuel. State and local taxes levied on aviation fuel are considered airport revenues. As such, these funds can only be expended for the capital or operating costs of the airport; the local airport system; or other similar aeronautical facilities directly related to air transportation. The state issued new guidance effective December 1, 2017 to comply with federal regulations. Before this change, some municipalities were using aviation fuel tax revenue to fund non-aviation related projects. Additional funds back to airports must now be used to fund capital projects and support operating expenses.

The availability of 24/7 fuel may warrant further investigation to understand pilots' specific concerns and to identify geographic areas that represent a particularly acute gap in the system. IDOT may also want to consider further investigating the feasibility of adding 24/7 fuel by self-service credit card reader to the airports highlighted in **Table 4.13**. Additionally, all future airport fuel facility development should consider the demand and inclusion of all available fuel types, including the latest developments in aviation fuel technologies. This includes SAF, as discussed in **Section 4.5.3**, as well as the potential future development of a lead-free alternative to 100LL (avgas) for piston-powered engines typical of certain types of GA flying. Avgas is the only lead-containing transportation fuel used in the U.S. and is a primary contributor to the relatively low levels of lead produced in the county. The FAA has partnered with the U.S. Environmental Protection Agency (EPA), engine manufacturers, and fuel producers to develop and deploy operationally safe alternatives to 100LL through the Piston Aviation Fuels Initiative (PAFI).[41] At the time of this writing in May 2021, a lead-free alternative to avgas has not been approved for use.

Additionally, the future arrival of electric- and hydrogen-powered aircraft may require the installation of additional airport infrastructure to support these new technologies, such as electric aircraft charging stations. In the long-term, the availability of electricity or hydrogen to power flight may become more important than access to conventional aviation fuels, particularly for short- and mid-distance travel. While this future scenario could bring numerous benefits in terms of environmental sustainability, cost stability, increased access to aviation services, and other considerations, fuel revenues to airports and the state could decrease unless alternative revenue production structures are established.

4.8. Growth of E-Commerce

Electronic commerce—more commonly referred to as "e-commerce"—refers to the buying and selling of goods or services using the internet. Over the past several years, e-commerce has redefined how many people in the U.S. purchase all manners of goods. Because e-commerce allows consumers to shop from the comfort of their home as opposed to traditional brick and mortar retailers, this trend has witnessed explosive growth during the COVID-19 pandemic. With more people than ever before comfortable and familiar with online purchasing, "virtual" shopping rates are not anticipated to abate even after COVID-19.

One of the major benefits of online shopping is the promise of near-immediate delivery. Driven by overnight and same-day delivery options offered by retailers, air cargo providers have witnessed significant upticks in demand. Historically used primarily for low-weight, high-value goods and perishables such as food and flowers, air cargo is now used to transport nearly all types of durable and nondurable

[41] https://www.faa.gov/about/initiatives/avgas/

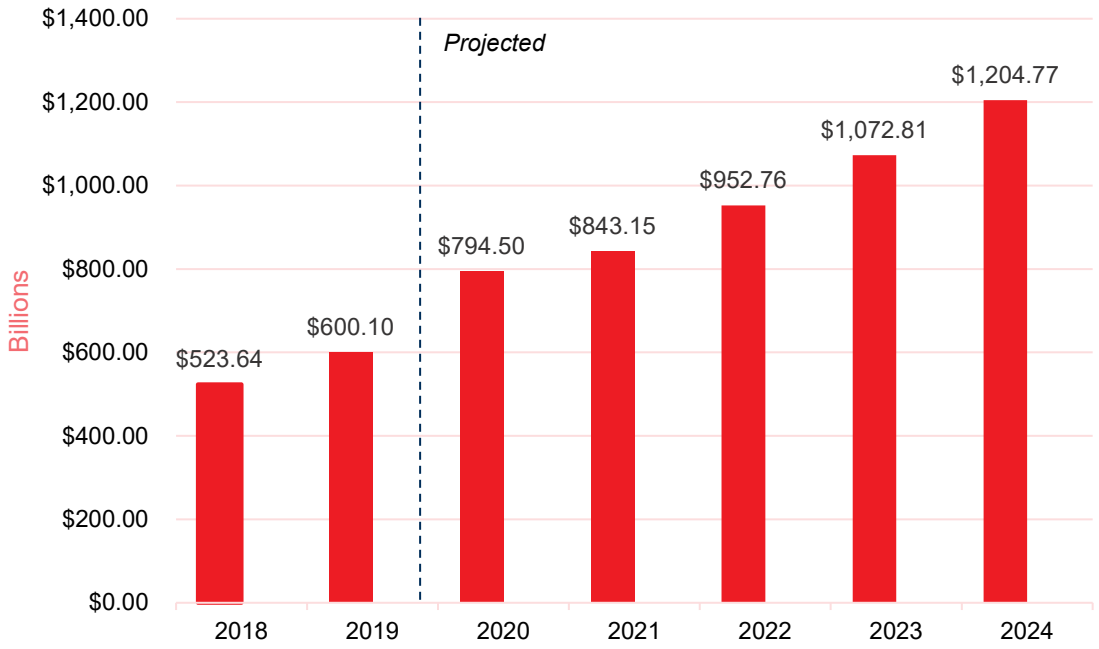
consumer products. With demand on the rise, the growth in e-commerce may have major implications for air cargo providers and the airports upon which they rely.

4.8.1. Impact of the Issue

While air cargo providers face stiff competition from alternative shipping modes such as trucks, container ships, and rail, retailers are increasing turning to air to meet consumer expectations. Major industry players such as Amazon, Walmart, and Apple compete to provide the fastest and most customer-friendly delivery experiences—creating a new type of "race to the bottom." Further, COVID-19 accelerated e-commerce growth in the U.S. in 2020, with online sales anticipated to reach a level not previously expected until 2022. According to forecasts prepared mid-2020 during the height of the pandemic, U.S. e-commerce sales were projected to reach $794.50 billion in 2020, up 32.4 percent compared to 2019. This would account for 14.4 percent of all U.S. retail spending in 2020 and 19.2 percent by 2024. Excluding gasoline and automobile sales, which are inherently difficult to sell online, e-commerce sales were expected to account for 20.6 percent of total U.S. retail spending by the end of 2020.[42] **Figure 4.11** depicts historic and projected growth of U.S. e-commerce sales from 2018 through 2023.

[42] https://www.emarketer.com/content/us-ecommerce-growth-jumps-more-than-30-accelerating-online-shopping-shift-by-nearly-2-years

Figure 4.11. U.S. Retail E-Commerce Sales, 2018 - 2024



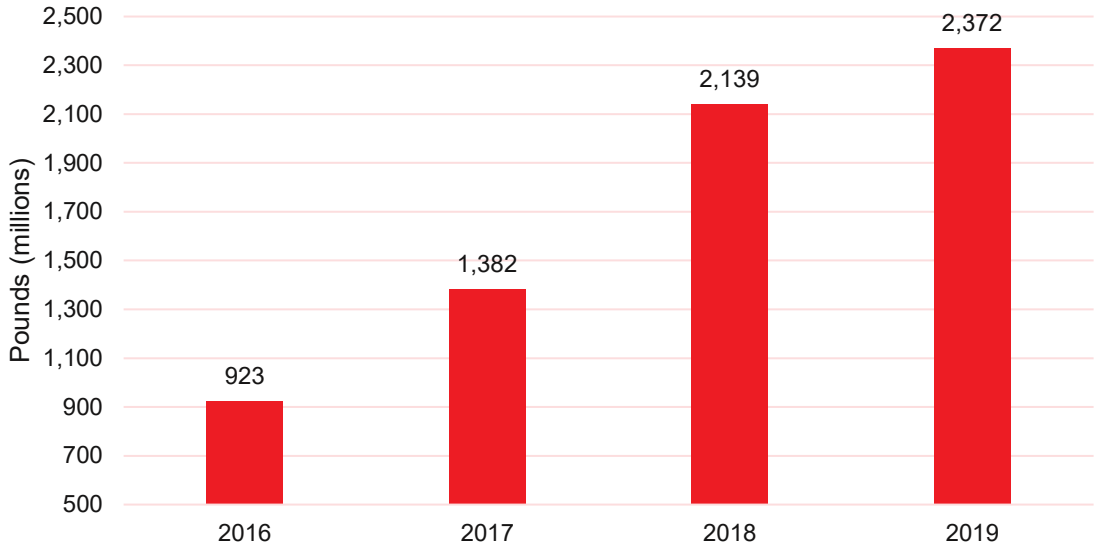
Source: eMarketer, October 2020

Chicago O'Hare International Airport (ORD), Illinois's largest airport by tons of cargo landed and the seventh largest in the nation by the same metric, witnessed a 6.15 percent increase in tonnage of cargo landed through September 2020 compared to the same time in 2019.[43] Air cargo operations, which are those conducted by dedicated all-cargo aircraft (as opposed to air cargo hauled in the bellies of passenger aircraft), were up nearly 22 percent in September 2020 as compared to the same month in 2019 to reach 21,604 cargo operations. Prior to the COVID-19 outbreak, the FAA had projected domestic cargo revenue ton miles (RTMs) to grow at an annual growth rate of 1.9 percent and international cargo RTMs to grow an average of 4.2 percent annually from 2020 through 2040.[44] The FAA may revise those figures in the forthcoming *Aerospace Forecast 2021 – 2041* based on the unexpected aviation trends of 2020.

Chicago Rockford International Airport (RFD) offers another illustrative example of the explosive growth in air cargo witnessed at some Illinois airports. The landed air cargo weight at Chicago Rockford International Airport (RFD) from 2016 to 2019 is depicted in **Table 4.11.** In 2017, 1.4 billion pounds of cargo arrived through airport, a 48 percent increase over 2016.[45] The airport continued to experience significant growth in the following years, with 2.1 billion pounds of cargo arriving in 2018 (54 percent year-over-year growth) and 2.4 billion pounds in 2019 (10.9 percent year-over-year growth). During this four-year period, RFD experienced 155 percent growth in landed air cargo weight.

[43] https://www.flychicago.com/business/CDA/factsfigures/Pages/airtraffic.aspx
[44] FAA Aerospace Forecasts, 2020 – 2040.
[45] https://www.ttnews.com/articles/amazon-poised-propel-cargo-business-illinois-rockford-airport

Figure 4.12. Chicago Rockford International (RFD) Landed Cargo Weight



Note: 2020 data is unavailable at this time of this writing. Source: FAA, 2020

In addition to an uptick in operations, e-commerce giants such as Amazon and logistics providers such as UPS and FedEx have moved to construct or expand air cargo facilities located at or adjacent to airports. These facilities support the transfer of goods between aircraft and ground transportation options (primarily trucks) responsible for the next segment of package delivery. Such expansion projects can quickly lead to significant congestion, overwhelm existing facilities, and push out other airport users. An airport's future expansion potential to support other aviation uses may similarly be constrained. Arterial and highway networks adjacent to and the vicinity of airports supporting air cargo operations can too experience congestion, leading to major traffic bottlenecks around airports. These traffic jams are not only frustrating for travelers but cost logistics providers millions of dollars annually as trucks and their drivers wait in traffic as they pick-up and drop-off freight and mail at airports.

E-commerce's boom could exacerbate the aviation workforce shortage, as more trained aviation professionals will be needed to meet the demand for air cargo. As Illinois airports like Chicago Rockford International Airport (RFD) continue to grow their presence as a hub for cargo, the already small pool of skilled workers will be even further strained to meet workload needs. However, with thousands of staff being furloughed or waitlisted by passenger airlines due to COVID-19, these concerns may be alleviated in the near- to mid-terms.

4.8.2. Next Steps

The current and potential impending demand for air cargo facilities may significantly impact capacity and congestion at airports in the coming years. IDOT should pay close attention to potential capacity- and congested-related concerns at airports with significant air cargo activities. Furthermore, it will be important to carefully balance passenger and cargo-related needs at the systemwide level to ensure all demands are met now and the years ahead.

4.9. PFAS

The availability of firefighting services either on or near the airfield is critical to ensuring the safety of people in the air and on the ground. Many larger GA airports and all commercial service airports have on-site aircraft rescue and firefighting (ARFF).[46] For many decades, AFFF containing PFAS have been used to extinguish fires and train firefighters in the airport environment. While AFFF are critically important to extinguishing petroleum-based fires, recent evidence has made the clear the discharge of AFFF containing PFAS presents an unacceptable risk to human health and the environment. Some progress has been made in the development and commercial adoption of AFFF free from PFAS. Additionally, the U.S. EPA has implemented new rules pertaining to AFFF manufacturing processes. Despite progress in these and other areas, airports continue to store and discharge PFAS-containing AFFF in a manner that falls short of recommended best practices. The risks associated with PFAS are becoming increasingly familiar to aviation professionals, and IDOT Aeronautics recognizes that managing PFAS-containing AFFF at Illinois airports must be addressed in the near-term.

4.9.1. Impact of the Issue

AFFF containing PFAS has been used extensively at airports throughout the world for decades to reduce risk of injury and death and damage to property in the event of petroleum-based fires. AFFF is applied during aircraft crashes and other incidents and often used in hangar fire suppression systems. While extremely effective in extinguishing fires, PFAS pose significant risks to human health and the environment. Exposure can lead to cancer; developmental defects; damage to multiple systems including the liver, thyroid, and immune system.[47] PFAS can travel long distances, permeate soil, seep into groundwater, and be carried through the air. The EPA has stated that any exposure to PFAS over 0.070 micrograms per liter (µg/L) or 70 parts per trillion (PPT), roughly equivalent to three drops of water in an Olympic swimming pool, in a lifetime can lead to significant health problems.[48] In 2018, the U.S. Department of Defense tested water near military airports for PFAS. Chanute Air Force Base near Paxton, Illinois, had an astronomical 806,000 PPT– well above the 70 PPT the EPA identified as toxic to human health. This tested also revealed that groundwater near Peoria International Airport (PIA) at 171,000 PPT of PFAS.[49]

At this time, U.S. airports are required to purchase firefighting foams that contain PFAS due to FAA regulations. As a result, airports have limited ability to remove PFAS from their facilitates entirely.[50] However, specialized discharge and containment equipment has recently been approved for use during testing exercises that allows FAA-compliant firefighting foam testing to occur without the need for regular foam discharges.[51] The FAA and some state departments of transportation including Colorado and

[46] All airports with Part 139 certification are required to have on-site ARFF capabilities.
[47] https://www.aviationpros.com/aoa/aircraft-rescue-firefighting-arff/article/21092898/the-evolving-concern-of-pfas-at-airports
[48] https://www.aviationpros.com/aoa/aircraft-rescue-firefighting-arff/article/21092898/the-evolving-concern-of-pfas-at-airports
[49] https://cdn3.ewg.org/sites/default/files/u352/Top%20100%20PFAS.pdf
[50] ACRP (2017). Report No. 173: Use and Potential Impacts of AFFF Containing PFAS as Airports. Available online at www.nap.edu/catalog/24800/use-and-potential-impacts-of-afff-containing-pfass-at-airports. p.1.
[51] https://www.codot.gov/news/2019/september/colorado-aeronautical-board-approves-funding-to-minimize-environmental-impacts-of-toxic-chemicals-in-firefighting-foam-at-colorado-airports

Michigan allow airports to use grant funds to purchase this equipment.[52] Furthermore, PFAS-free ARFF alternatives are currently under development and are being tested at airports in countries including Denmark, England, Germany, and Scotland.[53] While alternatives will be an important step in reducing the threat of severe environmental and human health impacts associated with PFAS, all firefighting foams have potential environmental impacts that must be carefully monitored and managed.

4.9.2. Next Steps

The issues surrounding PFAS are dynamic and expected to remain in flux for the near-term as state and federal regulators solidify guidelines and standards. Researchers will continue to develop PFAS-free AFFF as a safer alternative to existing technologies. At the national level, the EPA has made addressing PFAS an active and ongoing priority. In February 2019, the agency released the *PFAS Action Plan*, which outlines the agency's approach in addressing current PFAS contamination issues, preventing future contamination, and effectively communicating with the public.[54] Progress has been reported on all of these objectives, including the development of new tools and materials to communicate about PFAS. This latter point may be particularly germane in mitigating community health risks to populations adjacent to airports that deploy PFAS-containing firefighting foam. IDOT Aeronautics and airports should consider developing outreach tools and materials designed to effectively communicate complex information about PFAS to the specific populations in their vicinities. Such plans may need to apply principles of environmental justice to ensure all communities can access accurate, current, and clear information about PFAS.

In addition to national-level guidance and initiatives, the Illinois EPA launched its own investigation into the prevalence of PFAS in the state's drinking water at all 1,749 community water supplies in the state in September 2020.[55] The study is still underway, with the results being published online at https://www2.illinois.gov/epa/topics/water-quality/pfas/Pages/ pfas-statewide-investigation-network.aspx as they become available. The website includes an interactive dashboard and map. Airports can access this online resource to see if their airport is located near any community wells with identified PFAS concerns.

At the airport level, ACRP Report No. 173: *Use and Potential Impacts of AFFF Containing PFAS at Airports* provides a comprehensive resource about the use and risks associated with PFAS in airport environments. The study developed an accompanying screening tool to help airports adopt ARFF lifecycle best practices, identify and manage potential risks associated with historic and current AFFF use, and prioritize resources to address concerns related to AFFF and PFAS.[56] ACRP Report No. 173 also provides best practices pertaining to procurement, regulatory compliance, storage, applications, disposal, and identifying and addressing concerns related to legacy (i.e., past) usage. The ACRP report and associated PFAS screening tool are accessible online at www.nap.edu/catalog/24800/use-and-potential-impacts-of-afff-containing-pfass-at-airports.

---

[52] https://www.uppermichiganssource.com/content/news/First-of-its-kind-grant-program-deploys-airport-firefighting-equipment-eliminating-possible-PFAS-exposure-pathway-560179681.html
[53] https://www.aviationpros.com/aoa/aircraft-rescue-firefighting-arff/article/21092898/the-evolving-concern-of-pfas-at-airports
[54] https://www.epa.gov/sites/production/files/2019-02/documents/pfas_action_plan_021319_508compliant_1.pdf
[55] https://www2.illinois.gov/Pages/news-item.aspx?ReleaseID=22078
[56] ACRP (2017) p.2.

4.10. Rebuild Illinois Bill

On June 28, 2019, Governor J.B. Pritzker signed a bill into law allocating $45 billion to fund infrastructure improvement projects over a period of six years.[57] The bill is anticipated to greatly improve and modernize Illinois transportation infrastructure including roads, bridges, rail, airports, and rail while creating 540,000 jobs and revitalizing communities. The first round of funding totaling $25 million was fast-tracked for release in May 2020 in response to COVID-19. IDOT Aeronautics is receiving $558 million over the six-year funding period. This additional $93 million per year will be tremendously beneficial for Illinois system airport and allow the state to fund additional projects, particularly those that are ineligible for federal funding through the AIP or lower priority for state-only dollars. The bill will allow the state to advance important planning, environmental, and engineering projects that will lead to aeronautic facility improvements. Along with airport development projects to maintain existing facilities and enhance capacity, funding can also be used to:

- Support revenue-enhancing projects such as fuel farms and hangars
- Improve and expand air cargo handling facilities
- Enhance multimodal connectivity and airport access
- Upgrade and modernize fire protection and security systems
- Purchase ground support vehicles including snow removal equipment and ARFF vehicles
- Acquire property for clear approaches and Runway Protection Zones (RPZs) and airside and landside development needs
- Advance airport sustainability and resiliency

The following section discusses the potential impacts of Rebuild Illinois, the state's largest-ever capital improvement plan.

4.10.1. Impacts of Issue

Rebuild Illinois funds will be allocated on an annual basis, and projects will be selected based on a review of priority maintenance and capacity enhancement needs. Funds from the bill have the potential to fix many outdated facilities and infrastructure throughout the state – including the aging infrastructure discussed in **Section 4.2**. Furthermore, this major influx of capital dollars could address many of the challenges identified by the IASP. A list of potential project types by issue includes but is not limited to:

Aging Infrastructure

- Address deferred maintenance needs and modernize existing airside and landside infrastructure
- Construct new and rehabilitate existing hangars
- Improve commercial service and GA terminals to enhance capacity and the user experience

COVID-19

- Remodel existing terminal facilities to meet COVID-19 social distance requirements

UAS and Commercial Space

- Support the development of space launch facilities at Illinois airports
- Install equipment that detects UAS activity in the vicinity of airports

[57] http://www.idot.illinois.gov/about-idot/stay-connected/blog/rebuild-illinois

Fuel

- Install 24/7 self-service fuel farms at priority locations

Growth of E-commerce

- Construct new or expand existing air cargo handling facilities
- Improve roadway access to airports to address traffic bottlenecks in the vicinity of airports

PFAS

- Modernize AFFF storage and distribution systems to ensure the highest level of safety and environmental protection
- Approve the use of state aviation funds to acquire firefighting foam testing devices that eliminate the discharge of toxic PFAS-containing ARFFs into the environment such as the Ecologic System manufactured by E-One or the Oshkosh ECO EPF

Runway Condition

- Extend runways at airports that regularly experience aircraft operations by aircraft that are larger than they were originally designed to support
- Construct or maintain crosswind runways based on a state-specific prioritization model

The IDOT Office of Intermodal Project Implementation defines the rules for project funding eligibility in the Policy and Procedure Manual, which outlines three parameters projects must adhere to in order to receive funding, including:

- Projects and land shall be included as a feature on an approved Airport Layout Plan (ALP)
- All environmental approvals must be completed prior to letting of the project
- Project must meet state bond funding rules

Beyond these state-mandated requirements, the funding prioritization will be at the discretion of IDOT. At the time of this writing in January 2021, no specific projects have been identified. It is important to note that Rebuild Illinois funds allow for vertical construction–unlike some other types of state and federal funding. This includes facilities that are critical to the user experience (e.g., terminals) and support revenue generate (e.g., fuel farms and terminal buildings). The state has a unique opportunity to not only improve the condition of airports today but to ensure the long-term viability of the system by supporting airport self-sufficiency, environmental sustainability, and resiliency.

4.10.2. Next Steps

One of the primary outcomes of the IASP is the development of a comprehensive statewide capital improvement plan (CIP). This CIP incorporates existing federal, state, and local airport projects with additional projects identified during the study. The study is also updating the state project prioritization model used to identify project for funding. The model is geared towards a refined priority rating system that improves efforts related to diversity, inclusion, and equity. In addition, recommendations presented in **Chapter 10** will consider how program prioritization can positively and negatively impact low income or minority populations. Rebuild Illinois funds will significantly enhance the state's ability to address all aviation-related needs in Illinois to ensure the system remains safe, reliable, efficient, and modern for many years to come.

4.11. Runway Condition

An airport's design is primarily driven by the operational and physical characteristics of the most demanding aircraft that generally operate at the facility (at least 500 operations per year). Many jets, for example, require a minimum 5,000-foot-long runway (or greater depending on the elevation of the airport and average maximum temperature) to safely accommodate take-offs, landings, and accelerate stop distances. Ensuring that an airport has runways of the proper length and capacity is critical for safe and efficient airport operations. Airport and aviation stakeholders most commonly identified the following runway-related issues as potentially hindering the operational capabilities of Illinois airports over the 20-year planning horizon of the IASP:

- Runway Length
- Crosswind Runways

4.11.1. Runway Length

Runway length has a direct correlation with the type of traffic that an airport is able to support. Airports with longer runways can accommodate more demanding aircraft. Most airport managers cited the importance of supporting jet traffic at their facilities, which generally requires at least a 5,000-foot-long runway. The presence of an airport that supports jets—particularly those that are used for business/corporate aviation—is an important indicator of the health of local and regional economies. Not only does business aviation support well-paying jobs, but passengers and pilots arriving by jet generate additional economic impacts by spending money in nearby communities. Longer runway lengths may draw new business tenants to an airport to provide services to aircraft, the people and passengers they support, or both. Furthermore, longer runway lengths are required for many aviation activities associated with the well-being of residents such as community access, medical flights, wildland firefighting, and certain types of search-and-rescue and law enforcement operations. All of these activities can result in higher fuel sales and revenue back to airports.

The need for longer runway length is an issue that was identified by 19 percent of IASP airports. For example, the manager of Ingersoll Airport (CTK) noted, "Currently our runway length is not adequate to allow growth. We need to get out to 5000 feet (or longer). We have the land required to extent Runway 18/36 to 6,500 feet if we could get funding." Approximately half of IASP airports have at least a 5,000-foot-long runway (41 airports). Some airports may be regularly experiencing operations by aircraft larger than they were originally designed to accommodate. Although this does not necessarily indicate a safety issue, these situations do warrant additional analyses to determine if facility improvements are warranted to accommodate such activity. To receive funding for a runway extension, an airport must justify the need based on current or projected five-year activity levels and have that extension depicted on an approved ALP. Evaluating current and forecasted future aircraft operations are components of the master planning process.

4.11.2. Crosswind Runways

Runway orientation is paramount to airport safety, efficiency, economics, and environmental impact. Because aircraft are designed to take-off into the wind, runway orientation should be oriented based on the direction of the prevailing wind. As described in FAA AC 150/5300-13A (consolidated change 1), *Airport Design*, a wind data analysis considers wind speed and direction based on existing and forecasted operations during visual and instrument meteorological conditions. Crosswind runways are recommended

when the primary runway orientation provides less than 95 percent wind coverage, computed on the basis of the allowable crosswind component by Runway Design Code (RDC). The allowable crosswind component is provided in **Table 4.16**. Smaller aircraft have less ability to operate in windy conditions due to speed, power, and weight. As a result, the allowable crosswind component is less than at airports designed to support larger, heavier, and more powerful aircraft. Wind can be a contributing factor in small aircraft accidents.

Table 4.16. Allowable Crosswind Component per RDC

Runway Design Code	Allowable Crosswind Component
A-I and B-I*	10.5 knots
A-II and B-II	13 knots
A-III, B-III, C-I through D-III D-I through D-III	16 knots
A-IV and B-IV, C-IV through C-VI, D-IV through D-VI	20 knots
E-I through E-VI	20 knots

**Note: Includes A-I and B-I small aircraft. Source: FAA AC 150/5300-13A (consolidated change 1)*

Wind analyses are generally conducted using weather data for the previous 10-consecutive-year period in order to develop an accurate weather profile for the airport. Analyses should be developed based on the predominant use-period of the airport. For example, analyses can be conducted using seasonal data (e.g., winter/summer only), during daylight hours only, or using a combination of both factors (e.g., summer daytime only).

In general, the FAA does not fund the construction of new or maintenance of existing crosswind runways unless the primary runway does not meet the 95 percent wind coverage threshold. According the FAA's AIP Handbook, crosswind runways are "eligible if justified." Aviation stakeholders often cite this as a limitation to development, and many pilots would like crosswind runways constructed at nearly all airports to maximize use-periods and minimize any safety hazards associated with windy conditions. Several airports in the IASP identified the need for a crosswind runway as one of their top concerns. Currently 56 airports (67 percent) of system airports have a crosswind runway. This percent is higher than many other states, although perhaps this is not surprising for the home of the "Windy City."

When considering a crosswind runway, airports must account for the full implications of constructing an additional runway facility. Not only does the pavement require lifecycle care, but airports also become responsible for operating expenses. This includes mowing in the summer and plowing in the winter (if those time periods were included in the wind analysis justification). A plan would also have to be developed for the acquisition of RPZs through ownership or easements. The land required to develop a crosswind runway may better serve the long-term needs of the airport if developed in a manner that provides a revenue source back to the airport.

4.11.3. Next Steps

Proper runway planning and development is critical to the growth of airports and their ability to accommodate existing and future user demands. The need for runway extension and crosswind runway projects should be examined on a case-by-case basis to determine if needs are justified based on current and future capacity demands. Additional studies are warranted to determine if IDOT should provide additional state funding to support crosswind runways ineligible to receive federal dollars. In some cases,

states have considered implementing state-specific crosswind runway prioritization criteria. Regardless of if funding is obtained from state or federal sources, any proposed runway improvement projects must be justified in the immediate- or near-term and shown on the airport's approved ALP.

4.12. Summary

The aviation industry is currently experiencing a unique and perhaps unprecedented time in its history. The COVID-19 pandemic has caused scheduled commercial service activity to plummet; air cargo operations to increase; and GA experience both upticks and downturns depending on the activity, geographic area, and other factors. Emerging technologies such as UAS, UAM, and commercial space travel may someday affect the very fabric of how goods and people travel not only globally but perhaps even intergalactically. At the same time, issues that have affected the aviation industry for many years continue to stress the system. The aviation workforce shortage, aging infrastructure, FBO pricing transparency, and runway conditions are enduring concerns for airports; the sponsors and managers that administer them; and the pilots, passengers, and other users who rely on them. The recent economic stimulus bills including the CARES Act, CRRSAA, and—most notably for Illinois—the Rebuild Illinois Bill provide an influx of funding to address many of the priority concerns identified by the state's aviation community. The state has the opportunity to develop a modern, safe, and efficient aviation system that overcomes the challenges of the past and sets the stage for an exciting new future. At the same time, funding must be backed by sound policies and guidelines to ensure development is intentional, based on sound fiscal and environmental policies, and recognizes any long-term implications for individual airports and the system. The subsequent analyses of the IASP provide this foundation by offering guidance to help IDOT and airports navigate this tumultuous time in aviation history to emerge stronger, more resilient, and better prepared to leverage the opportunities that lie ahead.