Appendix F: Aviation

GET THERE TOGETHER.

Kentucky's Long-Range Transportation Vision

AIRPORT SYSTEM OVERVIEW

The Commonwealth of Kentucky is home to a broad aviation system providing a crucial role in connecting the state's transportation network to its diverse communities. Not only does the aviation system serve the needs of the transportation public, but it also ensures timely delivery of goods and services, plays a critical role in attracting commerce, supports public safety and emergency services, and trains our future aviation professionals. The state is home to 263 facilities including 90 private airports, 59 public use airports, and 115 heliports.[1]

Kentucky Statewide Aviation System Plan

The Kentucky Transportation Cabinet (KYTC) recognizes the importance of aviation and maintains the Kentucky Statewide Aviation System Plan (SASP) to plan for and analyze the state's airport system. The SASP monitors the system's condition and plans for meeting current and future needs based upon the goals, objectives, and performance measures of the system. The SASP consists of 59 airports identified as essential to the state's aeronautical needs. These airports are assigned a system role and classification.

Airport System Roles and Classifications

Within the SASP, KYTC assigns airport roles first by defining commercial service airports and second by objective factors including type of fuel sold, runway length, weather minimums, and related number of jet departures. As described in the 2017 Kentucky Statewide Aviation System Plan Technical Report.[2] Kentucky's system of airports falls into one of five roles described as follows:

[1] *FAA Data Portal | Federal Aviation Administration*. https://www.faa.gov/data. Accessed 27 September 2021.
[2] CDM Smith, "Kentucky Statewide Aviation System Plan," *Technical Report.* Kentucky Department of Aviation, August 2017. https://transportation.ky.gov/Aviation/Documents/2017%20Statewide%20Aviation%20System%20Plan.pdf

- Commercial Service Airports: These airports serve commercial airlines and are grouped separately from the general aviation (GA) airports in order to focus on the distinctions among the GA airports.
- Economic Level 1: These GA airports have the greatest economic potential. In general, these airports have 20 or more based aircraft, provide jet fuel, have the most effective instrument approach procedures, and offer pilot services such as automated weather reporting.
- Economic Level 2: These GA airports have significant economic potential. In general, these airports have 10 or more based aircraft, provide jet fuel, and have some type of instrument approach.
- Economic Level 3: These GA airports have developing economic potential. In general, these airports provide avgas (aviation gasoline), and some offer additional services, such as automated weather reporting or an instrument approach.
- Economic Level 4: These GA airports have limited economic potential. Some, but not all, of these airports offer avgas. Most do not have an instrument approach.

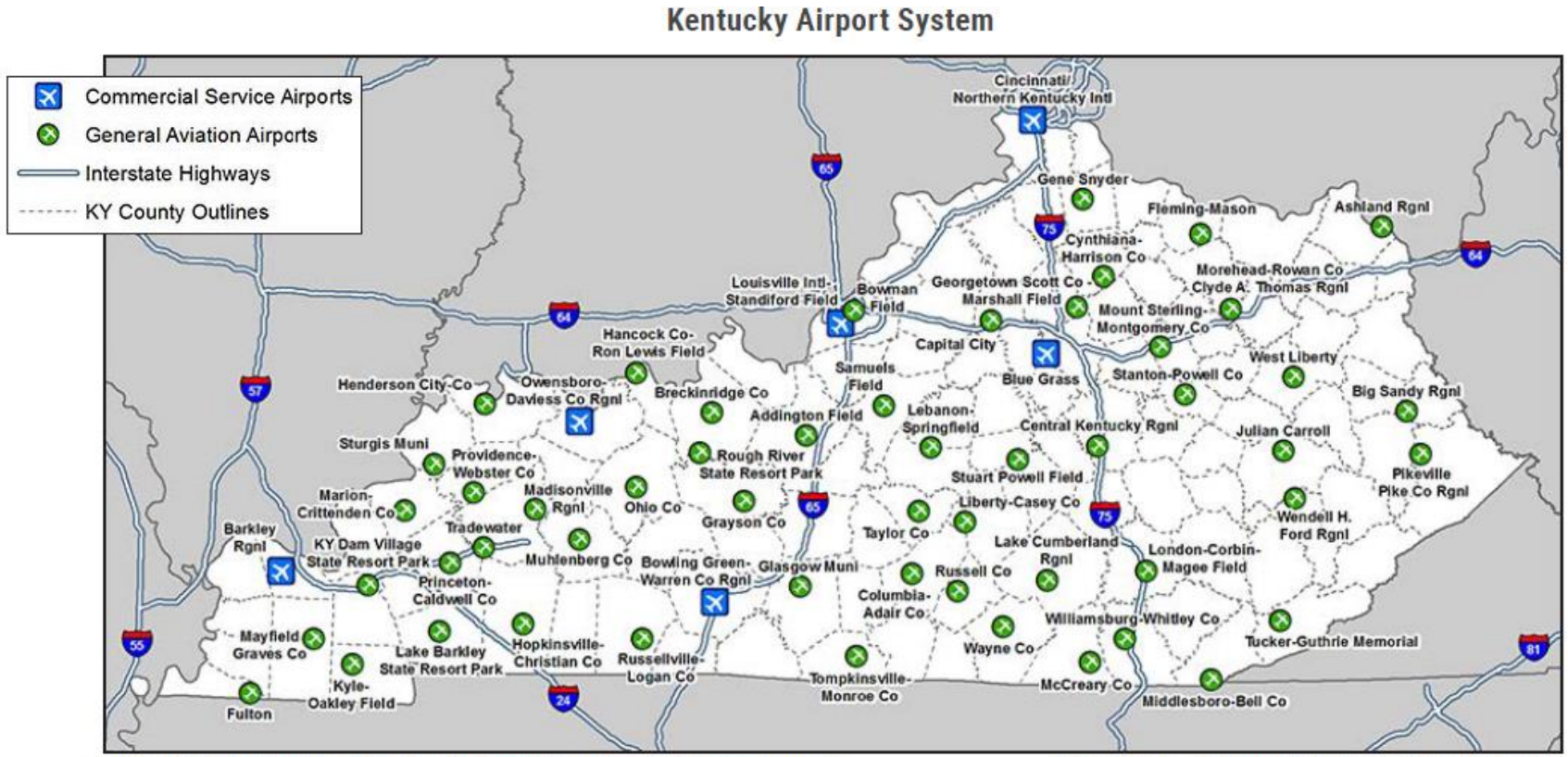
Table 1: Airport Roles in the Kentucky SASP

Airport Role	Number of Airports
Commercial Services Airports	6
Economic Level 1	24
Economic Level 2	8
Economic Level 3	10
Economic Level 4	11

Source: 2017 *Kentucky Statewide Aviation System Plan Technical Report*

Based upon these system plan roles and classifications, the state's 59 public use airports are broken down in Table 1. Figure 1 presents the SASP airports by role.

Figure 1: State Airports



Source: https://transportation.ky.gov/kyaviationsystem/Pages/Airport-System-Map.aspx

Note: Jet planes require a runway length of at least 5000 feet.
Note: Gallatin County has a general aviation airport under construction to be completed in 2023

SASP Performance and Benchmarks

As part of the continuous system planning process, KYTC has established measures of compliance with various key FAA airport design standards at all SASP airports. As stated in the 2017 *Kentucky Statewide Aviation System Plan,* these measures are:

- **Runway Width** – All airports meet the runway width recommendations.
- **Runway Safety Area (RSA)** – The RSA is a surface surrounding a runway designed to reduce damage to aircraft in the event of an overshoot or excursion from the runway.
- **Runway Protection Zone (RPZ)** – The RPZ is a trapezoidal area beyond the end of each runway that promotes compatible land use to ensure the safety of people on the ground. Airports should work to control the RPZ through ownership or land use controls.
- **Runway Object Free Area (OFA)** – The OFA is a safety standard that precludes most objects with the OFA that would create hazards for aircraft. Airports must ensure clear OFAs at their airports.
- **Runway Centerline Separations** – A number of runway separation criteria must be met by airports depending on the size of aircraft operating at the field. These standards include hold line separation, taxiway separation, and aircraft parking separation.
- **Runway Length** – Aircraft with higher speeds and payloads generally need longer runways to take advantage of their full capabilities. As a result, airports with greater economic potential generally need longer runways to accommodate more demanding aircraft and this is reflected in the runway benchmarks.
- **Runway Lighting** – Airports with runway lighting have greater utility since this permits night operations. Additionally, runway lighting can enhance the effectiveness of an instrument approach by making the runway environment easier for pilots to identify during periods of low visibility. The benchmark for runway lighting calls for high intensity runway lights at commercial service airports, where maximum runway utility is called for, and medium intensity runway lights at all but Economic Level 4 Airports.
- **Approach Lighting Systems** – Approach lighting systems assist pilots in identifying the runway threshold environment, helping them transition to the landing phase of their flight. Approach lighting systems are a prerequisite for some types of instrument approach procedures and are a recommended benchmark for Commercial Service Airports where the greatest utility can be obtained from an approach lighting system.
- **Instrument Approach Procedure** – The type of instrument approach at an airport affects the overall utility of an airport and can make it possible to land at the airport during inclement weather. At Commercial Service, Economic Level 1, and Economic Level 2 Airports, the recommended benchmark is an approach with vertical guidance, to support the greater economic potential at these airports by preventing weather diversions to the extent possible. Non-precision approaches are recommended for Economic Level 3 Airports, and Economic Level 4 Airports that do not have a recommended minimum approach type.

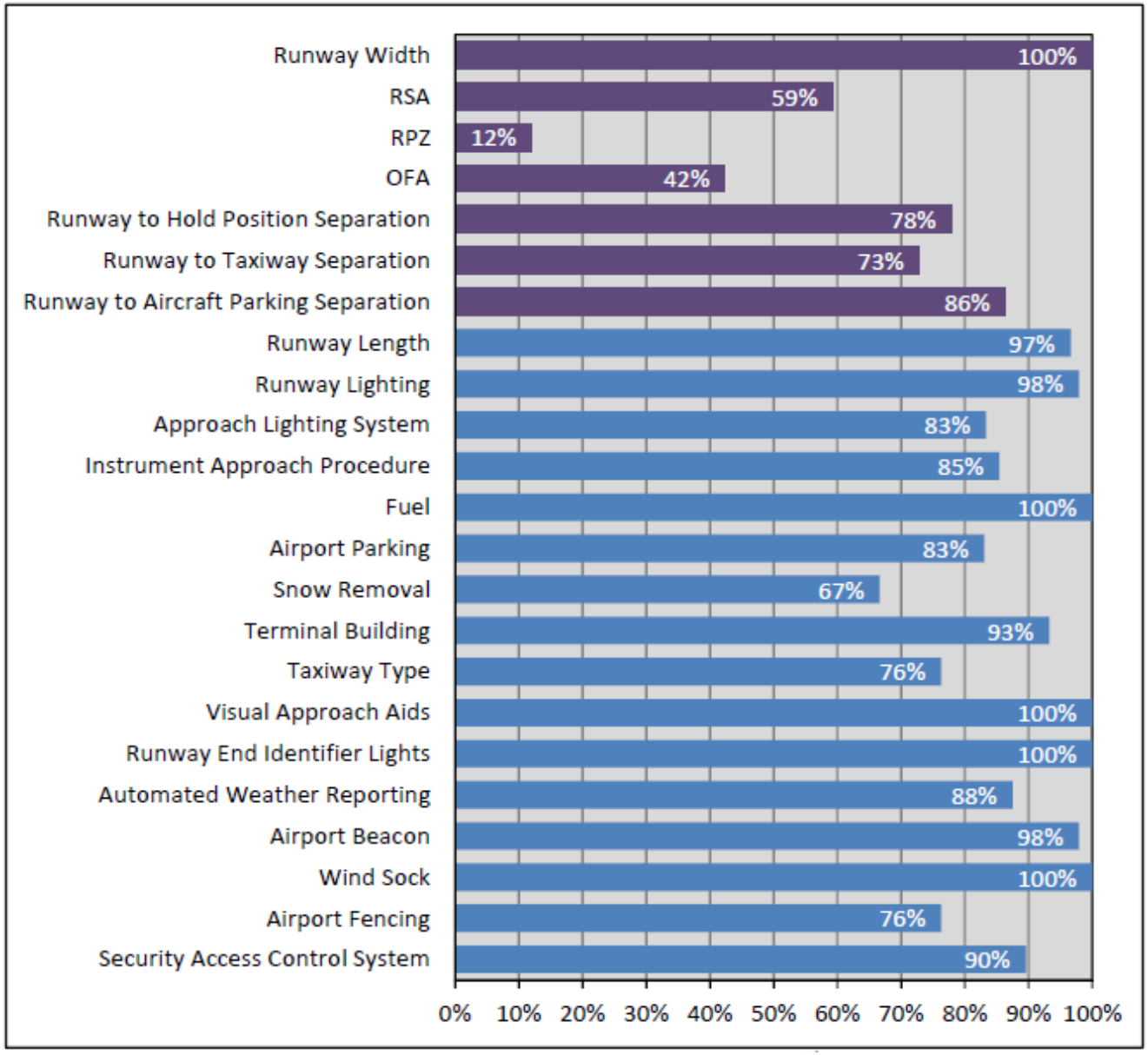
- **Fuel** – In order for an airport to fulfill its designated classification, it must provide the basic services to the users of the airport. Fuel is the most fundamental of these services, with users of turbine engine aircraft needing jet fuel and the users of nearly all piston engine aircraft needing 100LL avgas. All system airports, except for Economic Level 4 airports, are expected to be able to fuel piston aircraft, and those airports with significant amounts of jet traffic are expected to have jet fuel (i.e., Economic Level 1, Economic Level 2, and Commercial Service Airports). Additionally, it is recommended that Economic Level 3 Airports provide self-fueling options to pilots.
- **Airport Parking** – The amount of automobile parking available is an important component of providing adequate services to airport users. Since this performance measure is intended to be informational only, no recommended benchmark is established.
- **Snow Removal** – Winter use of airports in Kentucky depends upon the ability to remove snow from the airfield. The two means of providing snow removal at an airport are either for the airport to own, maintain, and operate the snow removal equipment (referred to as on-airport), or contract with another party to provide the snow removal services as needed (referred to as off-airport). On-airport snow removal provides greater reliability, but at higher cost, while off airport snow removal is typically less expensive, but may not be as responsive in situations where the provider may have higher priority snow clearance duties than keeping the airport clean. On-airport snow removal is the established benchmark for Commercial Service and Economic Level 1 Airports, where maximum operational efficiency is important for supporting the maximum economic potential of these airports. The benchmark for Economic Level 2 and Economic Level 3 Airports is off-airport snow removal, where operational efficiency needs to be balanced against the expense of the service, while no benchmark was established for Economic Level 4 Airports out of cost considerations.
- **Terminal/Administration Building** – Airports that are expected to handle general aviation passenger traffic have a need for a terminal/administration building where passengers can take shelter from the weather and environment, as well as provide a central meeting point for parties coming to the airport. For this reason, a terminal/administration building is recommended for all airports.
- **Taxiway Type** – The type of taxiway system at an airport is important for reasons of safety and efficiency. Without taxiways, aircraft must use the runway to back-taxi in order to line up for takeoff and to exit the runway after landing. This increases runway occupancy times for aircraft, which is both inefficient and increases collision risks for aircraft. Commercial Service and Economic Level 1 Airports are expected to accommodate larger aircraft, which tend to be less maneuverable, giving them a greater need for taxiways. For this reason, full parallel taxiways are recommended for Commercial Service and Economic Level 1 Airports. Economic Level 2 and Economic Level 3 Airports serving more maneuverable aircraft can increase safety and efficiency with partial parallel taxiways without incurring the expense of a full parallel taxiway. Therefore, partial parallel taxiways are recommended for Economic Level 2 and Economic Level 3 airports. Economic Level 4 airports are recommended for turnaround stubs.
- **Visual Approach Aids** – Visual glide slope indicators assist pilots in guiding their aircraft to the runway threshold along a safe and stable descent. Visual glide slope indicators (the most common being a precision approach path indicator, or PAPI) provide visual feedback to the

pilot on his vertical position relative to a fixed path that descends smoothly to the runway. Such systems enhance safety by ensuring obstacle clearance and proper aircraft positioning for a safe landing. PAPIs are a benchmark for all but Level 4 Airports.

- **Runway End Identifier Lights** – Runway end identifier lights (REILs) assist pilots in finding the runway threshold, especially in areas with substantial background lighting. REILs are a recommended benchmark for all but Economic Level 4 Airports, but only if the airport does not have an approach lighting system, which is a more effective but costlier method of directing a pilot's attention to the runway threshold.
- **Automated Weather Reporting** – Weather conditions, especially as they relate to visibility, determine if an aircraft is capable of getting into an airport. Knowing what those weather conditions are ahead of time greatly assists pilots with flight planning. It is also of use when making a diversion decision. Weather reporting at most airports is automated, either an Automated Weather Observing System (AWOS) or Automated Surface Observing System (ASOS). Automated weather reporting is recommended for all but Economic Level 4 airports, where cost considerations make it unfavorable.
- **Airport Beacon** – An airport beacon is a light that aids pilots in identifying the airport from a distance, especially at night. It is a fundamental component of any lighted airport and therefore a benchmark for all but Level 4 Airports.
- **Windsock** – A windsock provides a reliable, easy to use and maintain mechanism for indicating wind direction and speed. It is a fundamental component of any airport and therefore a benchmark for all airports.
- **Airfield Fencing** – Airfield fencing can serve two purposes. It can provide security, and it can enhance safety by preventing wildlife from becoming collision hazards on runways. Full airfield fencing is the benchmark for Commercial Service, Economic Level 1, and Economic Level 2 Airports to protect the more expensive and higher performing aircraft expected to operate at these airports. At Economic Level 3 and Economic Level 4 airports, partial airfield fencing is recommended to serve as a security deterrence.
- **Security Access Control System** – A security access control system helps an airport ensure that unauthorized personnel do not have access to airport areas that are restricted. This system is a recommended benchmark for all but Economic Level 4 Airports, where it is assumed that this component would be cost-prohibitive for many of the airports.

Figure 2 presents the overall system compliance with SASP performance benchmarks.

Figure 2: SASP Performance Benchmarks

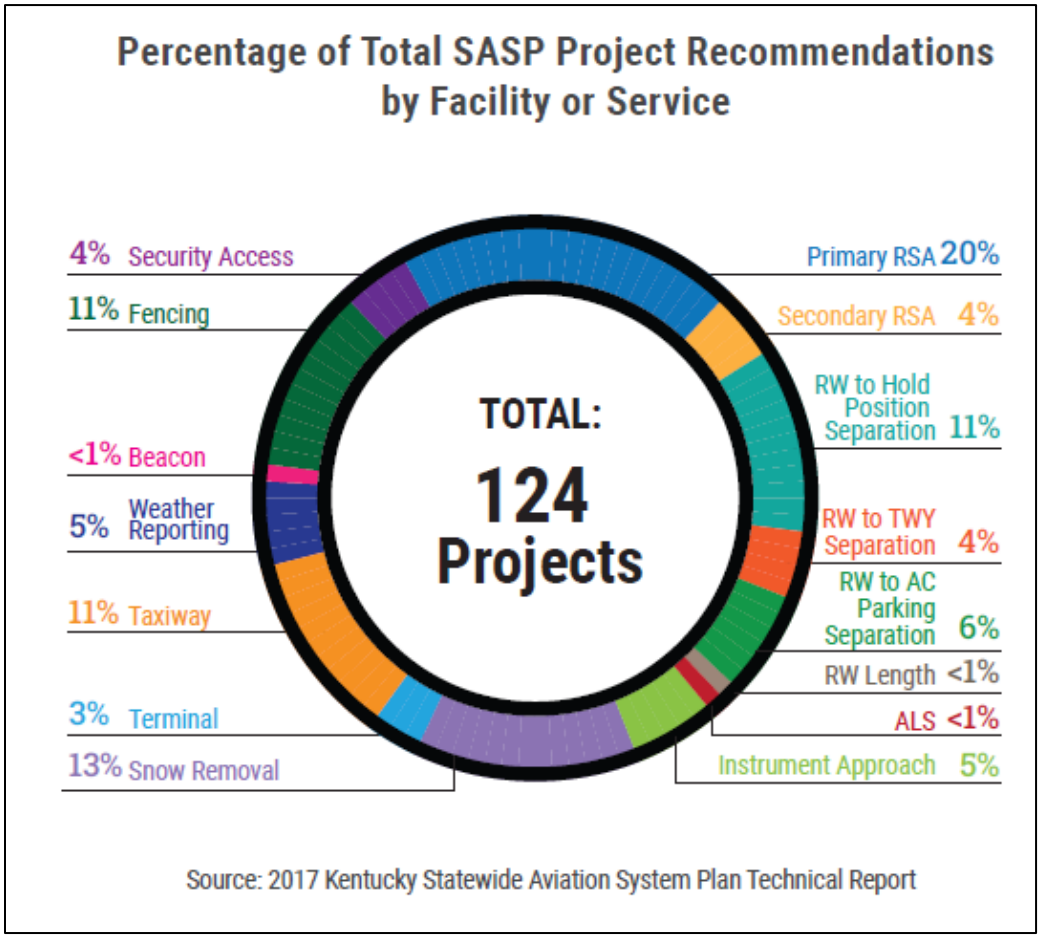


Source: 2017 *Kentucky Statewide Aviation System Plan Technical Report*

SASP Recommended System and Costs Estimates

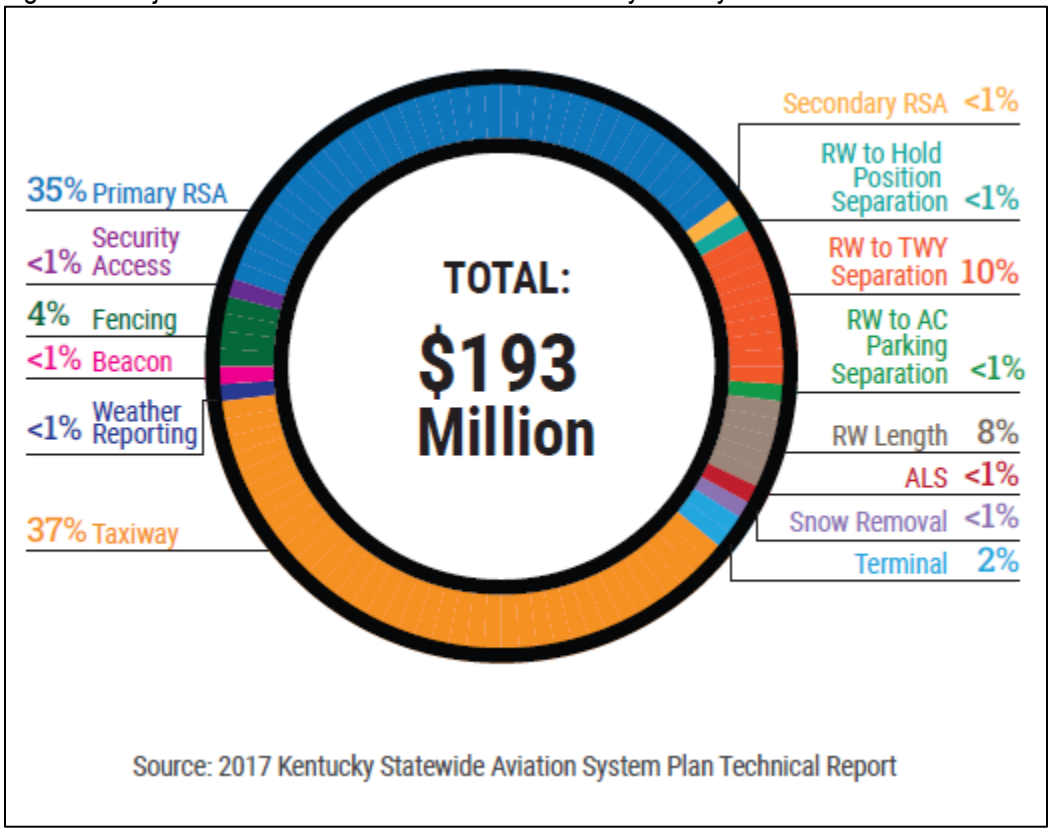
Based upon the recommendations of the Kentucky SASP, a total of 124 projects were recommended for a cost of $193 million in 2017 dollars. These costs, by type are presented in Figure 3 and Figure 4.

Figure 3: Percentage of Total SASP Project Recommendations by Facility or Service



Source: 2017 *Kentucky Statewide Aviation System Plan Technical Report*

Figure 4: Project Recommendation Estimated Costs by Facility or Service



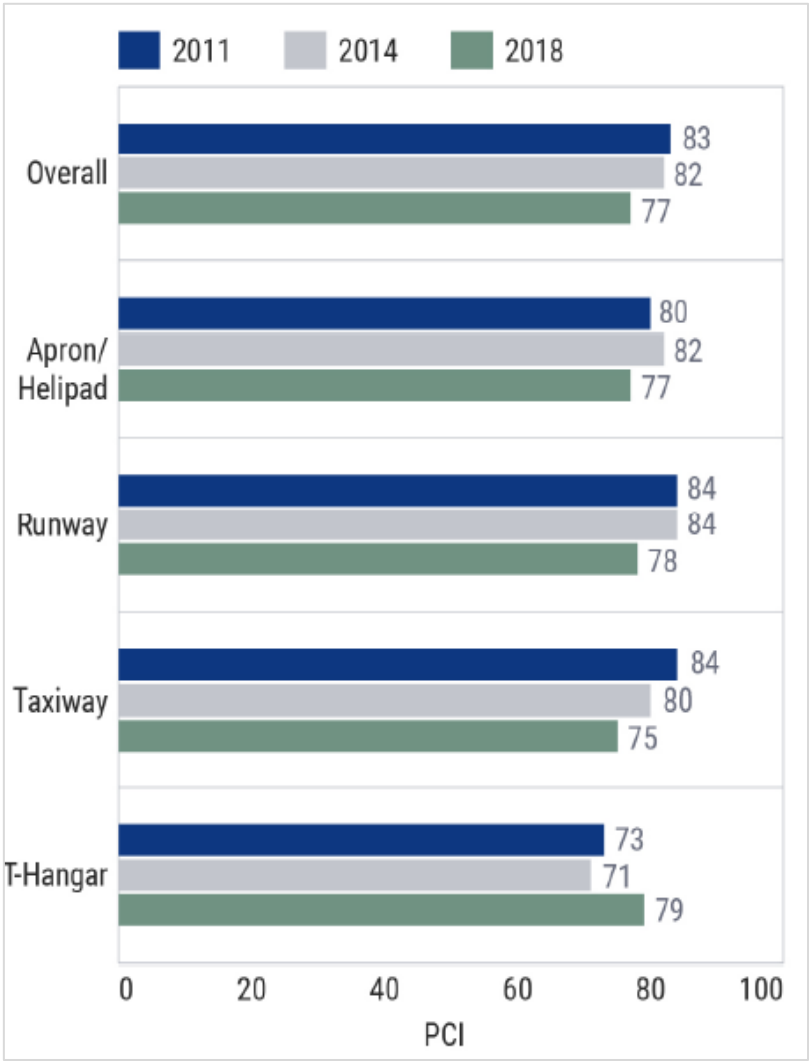
Airport Pavement Maintenance System (APMS)

One of the largest capital investments in the Kentucky aviation system is pavement. Maintaining these pavements is crucial to the system for both cost effectiveness and safety. To protect this critical investment, KYTC monitors the condition of it is core infrastructure using the statewide Airport Pavement Management System (APMS). The APMS provides a tool to airport owners, KYTC, and the FAA to insure proactive planning for preservation of its pavements. The most recent statewide assessment using the APMS was conducted in 2018. During the 2018 assessment, a Pavement Condition Index (PCI) procedure was utilized as the process to visually assess and monitor the condition of pavements. This procedure results in a PCI score ranging from 100 to 0 to measure overall condition.

The PCI ratings fall into three major categories:

- PCI 70-100 – Preventative Maintenance
- PCI 40-70 – Major Rehabilitation
- PCI 0-40 – Reconstruction

Figure 5: Overall Pavement Condition Index (PCI) of 52 KY Airports in State System



In 2018, 52 of the 59 system plan airports were evaluated. As reported in the Kentucky Airport Pavement Maintenance Program[3], the overall statewide score was 77, which is lower than the previous score of 82 in 2014 and 83 in 2011. Figure 5 provides a comparison of the 2018 area-weighted PCI and the previously observed values.

Based upon the conclusions of the report, if $120.2 million were spent on maintenance and repair projects over the next seven years, the PCI of study airports would rise to 87 by 2026. Investments of only $5 to $11 million over that same period would result in PCIs of 71 and 80, respectively.

Economic Impact of Airports

In addition to evaluating the role, service, and facility requirements of the 59 system plan airports, the 2017 *Kentucky Statewide Aviation System Plan* also calculated the economic impacts of airports limited to on-airport employment and payroll. This evaluation did not include direct economic activity such as visitor spending, or multiplier effects associated with direct impacts. Based on this limited analysis, the report found that the 59 public use airports in Kentucky generated more than 23,000 direct jobs and airports and over $1.44 billion in annual payroll.

[3] Applied Pavement Technology, Inc., "Kentucky Airport Pavement Maintenance Program" *Executive Summary*. Kentucky Department of Aviation. January 2020. https://apps.legislature.ky.gov/CommitteeDocuments/34/12822/Kentucky%20Airport%20Pavement%20Maintenance%20Program%20Executive%20Summary%20Report.pdf

KEY TRENDS, CHALLENGES AND OPPORTUNITIES

Trends

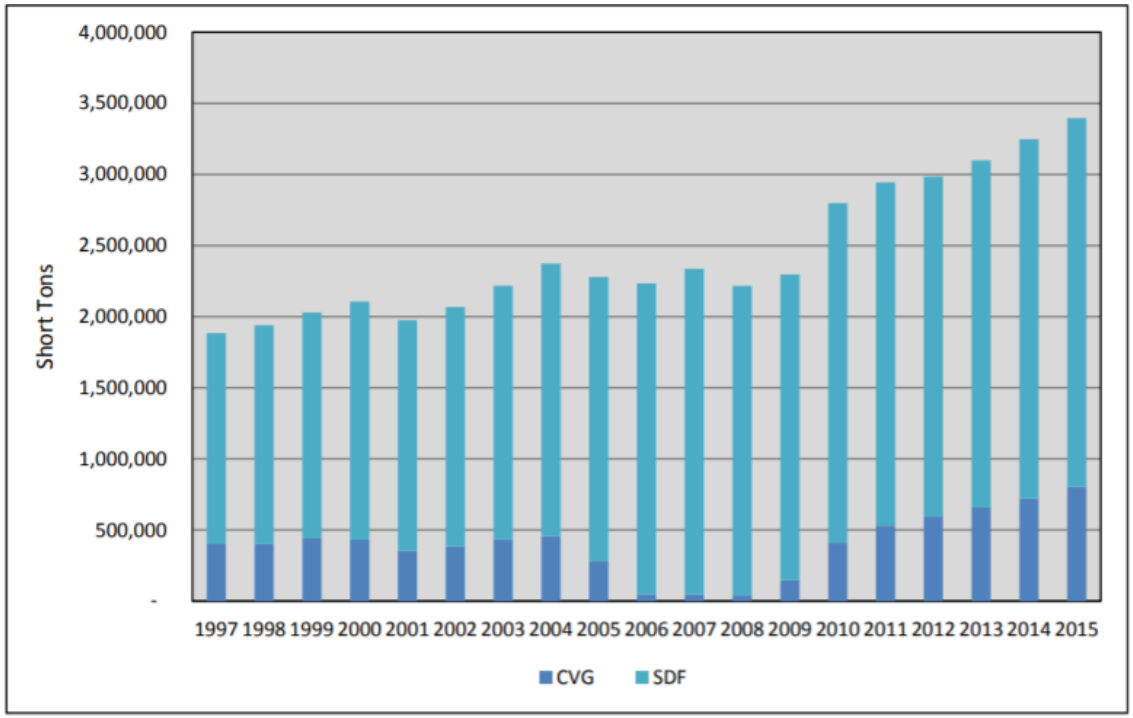
General Aviation (GA) Trends

A key trend is the number and type of new GA aircraft entering the fleet, the number of active GA aircraft, and the number of pilots flying in the U.S. An analysis of GA parameters shows that recent trends have not been positive. New aircraft deliveries, the number of active aircraft, and the overall pilot population have suffered from the recession that began in late 2007 and have not recovered to pre-recession levels. The high cost of aviation has contributed to the decline in aviation activity. While there are some segments of GA that have shown promise, such as the business use of GA aircraft and the niche markets of experimental aircraft and the sport pilot sector, the overall trend in GA is likely to be negative for at least the short term, if not longer.[4]

Air Cargo Trends

Air cargo plays a vital role in global commerce, and Kentucky's airports play a major role in facilitating the flow of air cargo on global, national, and regional scales. Air cargo activity is supported at Kentucky's Commercial Service Airports in the form of belly cargo carried on passenger airlines and express freight carried by integrated express carriers. Statewide, total air cargo tonnage is driven by the two air cargo hub operations at the Cincinnati/Northern Kentucky International Airport (CVG) and the Louisville Muhammad Ali International Airport (SDF). Kentucky is home to two major air cargo hubs operated by integrated express carriers DHL (CVG) and UPS (SDF). These hubs serve as sorting facilities that handle significant

Figure 6: Historic Air Cargo Tonnage 1997-2015, CVG & SDF



[4] "Kentucky Statewide Aviation System Plan" Kentucky Department of Aviation. August 2017. https://transportation.ky.gov/Aviation/Documents/2017%20Statewide%20Aviation%20System%20Plan.pdf

volumes of air cargo throughput, a small fraction of which originates in or is destined for Kentucky. Figure 6 shows the cargo growth experienced at these two airports from 1997 to 2015.

Unmanned Aerial Vehicles

The growth in unmanned aerial vehicles (UAV) has been spurred by improvements in engine technology, battery life, and miniaturization of components, all of which have driven down the costs of these easy-to-operate vehicles. As a result, recreational and especially business use of UAVs has proliferated. Demand for commercial UAV services appears to be growing despite uncertainty around how the FAA plans to integrate UAV operations safely into the national airspace system. The use of UAVs is expected to impact airspace and airport operational standards.

The following industries are just a sample of the businesses that expect to capitalize on UAV growth.

- Agriculture – UAV operations can provide farmers with information on how their crops are performing and provide the ability to apply pesticides, fertilizer, and seed to specific areas.
- Energy – Currently, pipeline and powerline inspections are carried out by manned aircraft. UAV operations have the potential to conduct these inspections for reduced costs.
- Retailing – Companies such as Amazon and Walmart are exploring how UAVs can be used to deliver products ordered online.
- Film Industry – The movie and TV industry expect to make use of UAVs as aerial filming platforms.
- Insurance – UAV operations can provide the insurance industry with information more quickly and efficiently than current methods. For example, UAVs can be used to inspect roofs to evaluate a homeowner's policy, or survey damage from a tornado to speed claims.
- Real Estate – UAV use is expected be a boon for the real estate industry, giving the ability to view hard to reach areas of properties and provide views that are inaccessible to those on the ground.
- Law Enforcement – Police departments are interested in using UAVs to aid in tracking suspects and monitoring for illegal activity.
- Search and Rescue – UAV operations are ideal for when search and rescue is undertaken in remote areas where access is limited.

Challenges

- Aviation gasoline, or avgas, is the primary aviation fuel used by piston-powered aircraft. It is notable for being the only remaining transportation fuel still containing lead, which is used to protect against engine detonation, also known as knocking. It is generally acknowledged that avgas will not be available in the future, for a number of reasons. For starters, the only western manufacturer of the lead additive is Innospec, a U.S. specialty chemical company that could choose to cease production for liability, financial, or other reasons. Another factor is pressure from environmentalists, who want to eliminate the use of leaded fuel.

- The air cargo industry has experienced significant volatility that has resulted in rapid maturation of the industry. High fuel costs and a recessed economic climate caused an industry shift to trucking, where unit cost savings became higher priority than shipment time.

Opportunities

- At the state level, Kentucky is likely to feel the impacts of these trends. However, Kentucky does have a number of positive attributes in terms of aviation. Recent initiatives have helped boost the student pilot population in Kentucky, thanks to aviation education. Additionally, aerospace products manufactured in Kentucky have continued to be the number one export for several years, surpassing even automobiles and automotive parts. In 2016, Kentucky's aerospace businesses exported $10.8 billion worth of products.

- CVG's air cargo tonnage is poised to continue growing as Amazon announced in early 2017 its plans to build a centralized hub at CVG for its newly formed cargo airline, Prime Air. Amazon's $1.5 billion investment resulted in a 3 million square foot facility expected to accommodate express e- commerce traffic from more than 200 daily takeoffs and landings by the Prime Air fleet.