Chapter 6. Existing System Performance

6.1. Introduction

As previously mentioned in **Chapter 1. Study Design and Goals**, the 2020 Colorado Aviation System Plan (CASP) goals were developed by reviewing multiple existing resources and conducting extensive stakeholder engagement. Existing resources included the current Statewide Transportation Plan 2040 (*Transportation Matters [SWP 2040]*), the CDOT Division of Aeronautics' *2018 Strategic Plan*, and the 2011 CASP. Four goal categories were ultimately established following consultation from both the 2020 Project Advisory Committee (PAC) and CDOT Division of Aeronautics. The 2020 CASP goals are as follows:

1. **Safety and Efficiency**: Advance Colorado's airport system by promoting and preserving safe and efficient facilities, on and off airport.
2. **Access and Mobility**: Provide Colorado's airports with infrastructure and sufficient capacity enabling the public adequate access and mobility utilizing the aviation system.
3. **Economic Sustainability**: Support sustainable economic growth and development and continue Colorado's existing status as a leader in technology, testing, and the aerospace industry.
4. **System Viability**: Preserve airport system assets to promote fiscal responsibility and sustainable, cost-effective investments to ensure the system's long-term viability.

This chapter has two primary sections: 1) analysis of performance measures (PMs) and system indicators (SIs) by goal category, and 2) evaluation of facility and service objectives. PMs and SIs were developed as tools to measure the system's ability to achieve each goal category. PMs and SIs are both important components of assessing system-wide performance, but they serve different functions. PMs quantitatively evaluate specific aspects of system performance that can be directly affected by project funding, policies, and other external inputs (actionable by CDOT Division of Aeronautics). SIs serve as a reporting mechanism on aspects of system performance (informational). SIs are not necessarily all actionable, in that many may not be affected by funding, policies, and inputs. Some SIs may influence a policy decision and/or be related to a PM that has an action associated with enhancing the system's performance. Facility and service objectives provide the minimum recommended guidelines regarding the infrastructure, facilities, and services required to best support the type and volume of aviation activity associated with the Colorado airport system classifications. They offer specific guidance on how airports can improve their abilities to serve constituents and enhance the statewide aviation system. A complete list of the facility and service objectives by airport classification can be found in **Chapter 5. Airport Role and Classification Analysis**. It should be noted that the analysis of PMs and SIs and the evaluation of facility and service objectives are reported system-wide and by airport classification. Individualized facility and service objectives by airport can be viewed in **Appendix B. Airport Report Cards**. The report cards showcase each airport's existing conditions, specified facility and service objectives, and if the airport meets their objectives. A comprehensive list of system-wide performance for PMs, SIs, and facility and service objectives organized by airport classification can be found in **Appendix C. 2018 Performance Data**.

6.2. Goal: Safety and Efficiency

As presented in **Chapter 1. Study Design and Goals**, Safety and Efficiency was identified as the first goal of the 2020 CASP to advance Colorado's airport system by promoting and preserving safe and efficient facilities, on and off airports. It is essential that the safety of pilots and passengers in the sky, as well as individuals and property on the ground, remain at the forefront of all policies, projects, procedures, and other components of aviation. It is for this reason that safety is one half of the first goal for the 2020 CASP. In conjunction with safety is the importance of efficiency. An aviation system must not only strive to be safe, but also efficient given the high costs of maintenance, construction, and operation of the facilities and the aircraft. Aviation systems operate interdependently which requires airports to operate efficiently to reduce delays and congestion which is inherently safer. There are many components that contribute to a safe and efficient system, and many of those components are reflected in the PMs and SIs included in this goal category.

6.2.1. Performance Measures

This section discusses the results of the PMs associated with the safety and efficiency goal category. PMs for this category include the following:

1. Percent of airports with approaches negatively impacted by obstructions
2. Percent of airports that have full perimeter wildlife fencing
3. Percent of airports that have adopted appropriate land use controls
4. Percent of NPIAS airports that meet current FAA design standards under AC 150/5300-13A

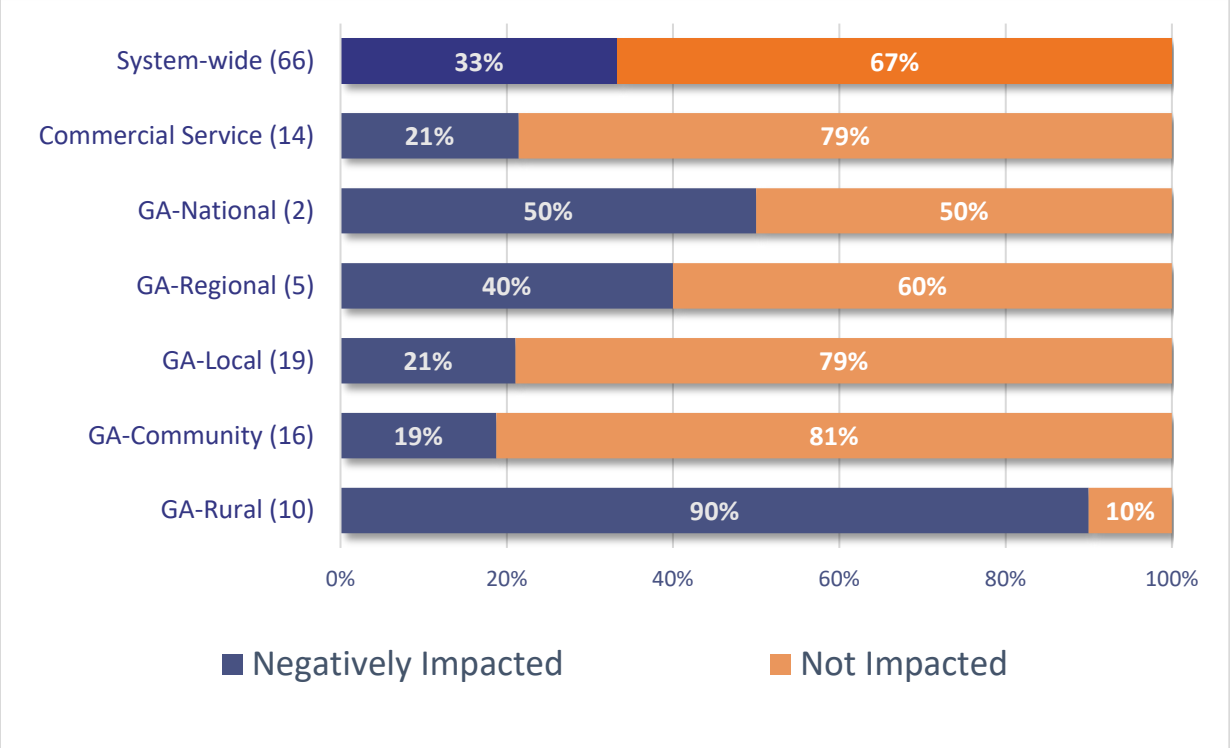
6.2.1.1. Percent of Airports with Approaches Negatively Impacted by Obstructions

The presence of an obstruction that negatively impacts the approach of a runway can cause safety concerns for system users both in the air and on the ground. When obstructions are present within the approach to a runway, it can result in the approach slope being modified so aircraft can clear the obstruction, the implementation of a displaced threshold, or both. When the approach slope is modified, visibility minimums are raised, requiring pilots to have the runway in sight at higher altitudes to land. This reduces the usability of an airport in times of reduced visibility and inclement weather. When obstacles cannot be relocated or mitigated, a displaced threshold may be implemented which relocates the threshold further down the runway, ultimately shortening the runway's available landing distance. As such, it is important to understand what percent of airports within the system have approaches that are negatively impacted by obstructions. Obstructions can include human-made infrastructure, such as buildings, transmission lines, and cell phone towers, as well as natural features like hills, mountains, and vegetation. **Figure 6.1** summarizes system-wide conditions on airports with approaches negatively impacted by controlling obstructions as reported by information from the FAA's Form 5010 Master Record. It should be noted that the following analysis is based only on each CASP airport's primary runway.

For **Figure 6.1** and all subsequent figures, the number of airports in each classification is denoted with parentheses next to the airport classification in the Y-axis (e.g., System-wide [66], Commercial Service [14], GA-National [2], etc.) to allow for ease of reference relative to the percent of airports that meet the associated PMs and SIs.

Per the findings of the analysis shown in **Figure 6.1**, 35 percent of system airports have approaches which are negatively impacted by obstructions. GA-Rural airports represent the airport classification with the highest percentage of airports with these types of obstructions at 90 percent. GA-Community airports comprise the lowest percentage of airports in their classification to have an obstruction which negatively impacts the approach to the runway.

Figure 6.1. Percent of Airports by Classification with Approaches Negatively Impacted by Obstructions



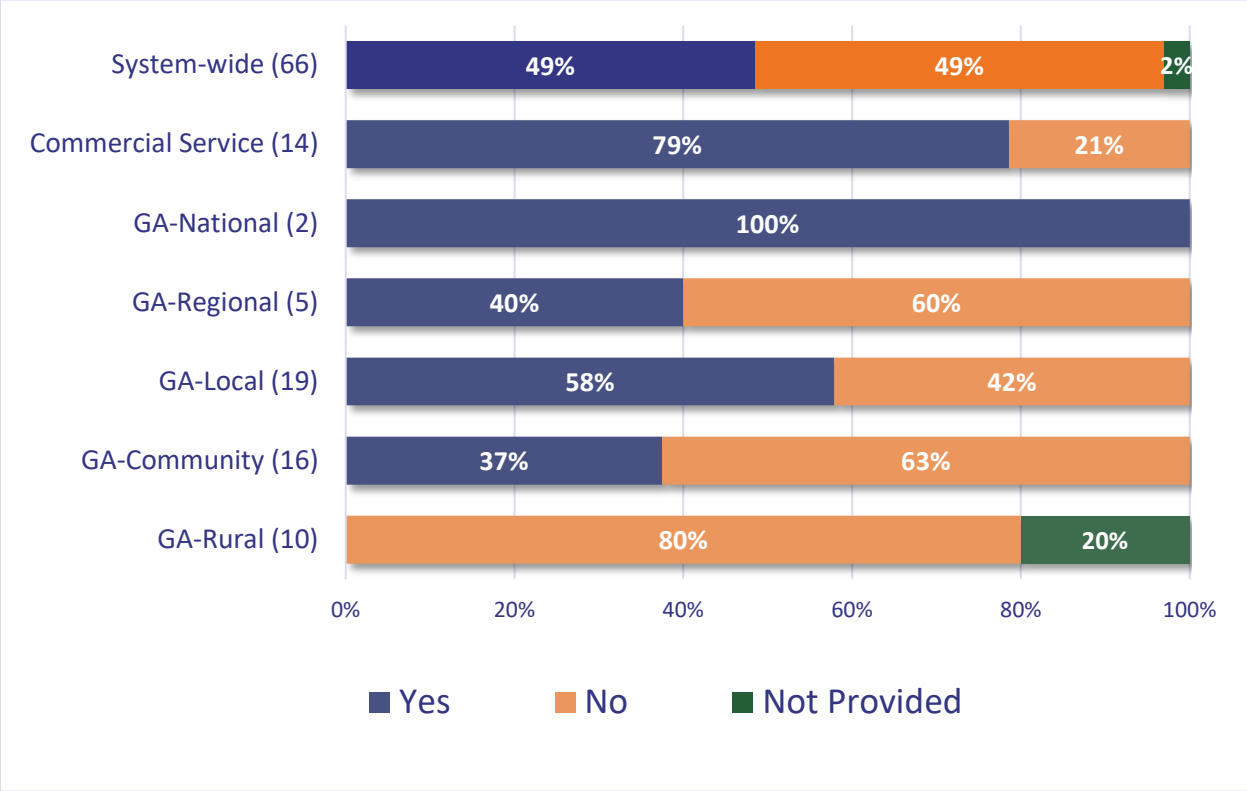
Source: FAA Form 5010, 2019

6.2.1.2. Percent of Airports that Have Full Perimeter Wildlife Fencing

Wildlife can present serious safety risks to airport operations, potentially endangering aircraft and their occupants, as well as the wildlife. Aircraft collisions with wildlife pose some of the most common and costly aircraft damage at airports. Mitigating these risks is essential to the continuity of safe and efficient aviation activity. One best practice for decreasing the impact of wildlife on airport safety is to reduce the opportunities for wildlife to enter airport property.

Based on airport manager responses, nearly 50 percent of airports system-wide report having full perimeter wildlife fencing. Approximately 80 percent of Commercial Service airports and all GA-National airports have full perimeter wildlife fencing. In addition, GA-Regional (40 percent), GA-Local (58 percent), and GA-Community (37 percent) airports report having full perimeter wildlife fencing. Of the GA-Rural airports that responded to this element of the data request, none had full perimeter wildlife fencing. **Figure 6.2** presents airports system-wide and by classification that have full perimeter wildlife fencing.

Figure 6.2. Percent of Airports by Classification that Have Full Perimeter Wildlife Fencing



Source: 2018 Inventory & Data Form

6.2.1.3. Percent of Airports that Have Adopted Appropriate Land Use Controls

Establishing land use controls in the surrounding areas near airports helps minimize hazards to aircraft in flight and the surrounding community. It is also a requirement of airports that accept FAA grants. FAA Grant Assurance 21 includes the following language applicable to these airports:

> *(airports) must take appropriate action, to the extent reasonable, including the adoption of zoning laws, to restrict the use of land adjacent to or in the immediate vicinity of the airport to activities and purposes compatible with normal airport operations, including landing and takeoff of aircraft.*

The purpose of this is to "to protect the federal investment through the maintenance of a safe operating environment."[1] While the concept of land use control may take different forms in different communities, it is most often employed through municipal and county zoning, development standards (such as height restrictions), and building codes. Some communities focus their effort only on enforcing height limitations for new development, while others focus on controlling the type of underlying land uses permitted. In either case, implementing land use controls around airports help prevent or mitigate the development of incompatible land uses which would otherwise negatively impact (or be negatively

[1] Airport Cooperative Research Program (ACRP) Report 27: *Enhancing Airport Land Use Compatibility, Volume 1: Land Use Fundamentals and Implementation Resources (2010)*

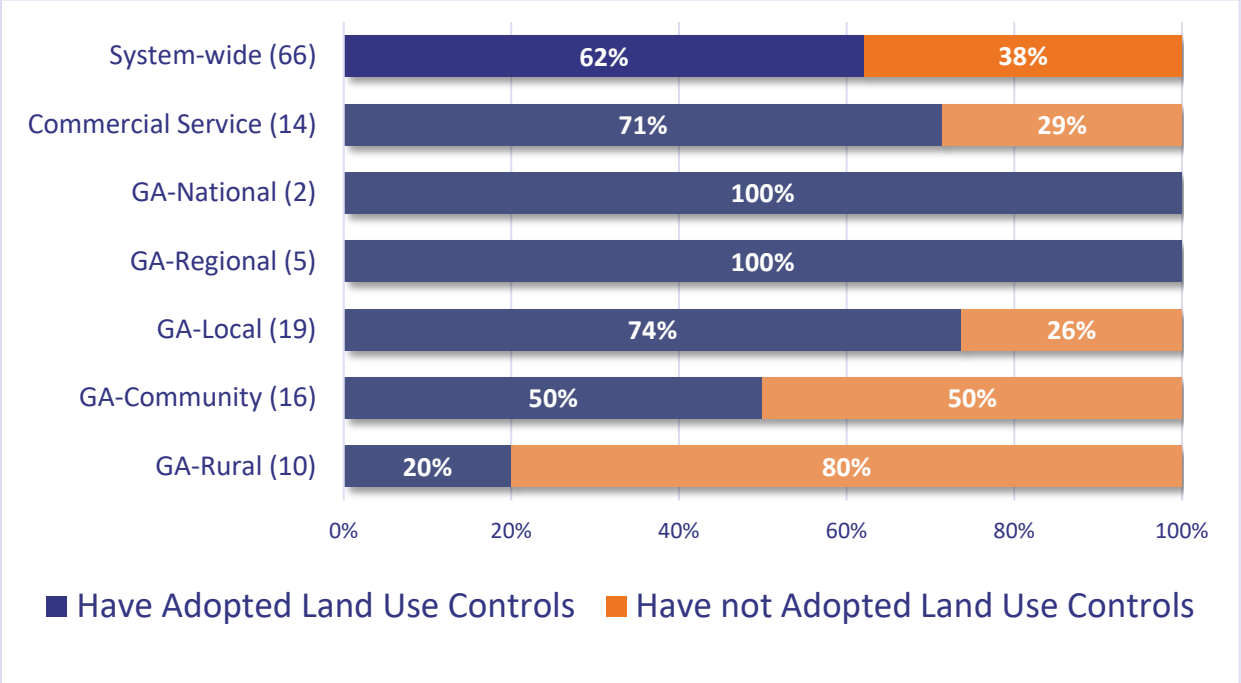
impacted) by aviation activity. In Colorado, this can often be challenging as many airports are in or near cities or counties that have potential land use impacts on an airport but may not themselves be sponsors subject to FAA grant assurances.

The FAA has encouraged land use protection in several advisory circulars (ACs) that provide guidance to airports on development of compatible land uses, discouraging incompatible uses such as residential or tall structures within the surrounding navigable airspace, and mitigating negative noise impacts on local communities. Due to the uniqueness of each airport, the form or method of implementing controls differs according to the needs of the airport and the surrounding community. It is important to realize that airports as an operating entity on their own cannot implement land use controls. Some airport owners and sponsors can zone in their own political subdivision, but many airports require protection or control outside their boundaries. Although the FAA highly recommends that airports obtain ownership of areas closest to the airport to implement safety practices such as for their runway protection zones (RPZs), airports must work in partnership with the appropriate counties and cities that are responsible for zoning.

Airports were asked about the presence of aviation-related land use controls in their surrounding communities. **Figure 6.3** and **Figure 6.4** show the percent of airports that report their local zoning authority has adopted aviation-related land use controls or height regulations by airport role.[2] Systemwide, more than half of all airports report that their local zoning authority has adopted both aviation-related land use (58 percent) and height controls (62 percent) associated with protecting the airport and community. All GA-National and GA-Regional airports report their local zoning authority has implemented both land use controls and height regulations related to their airports. GA-Rural airports report that their local zoning authority has implemented height controls for 10 percent their airports and land use controls for 20 percent of their airports.

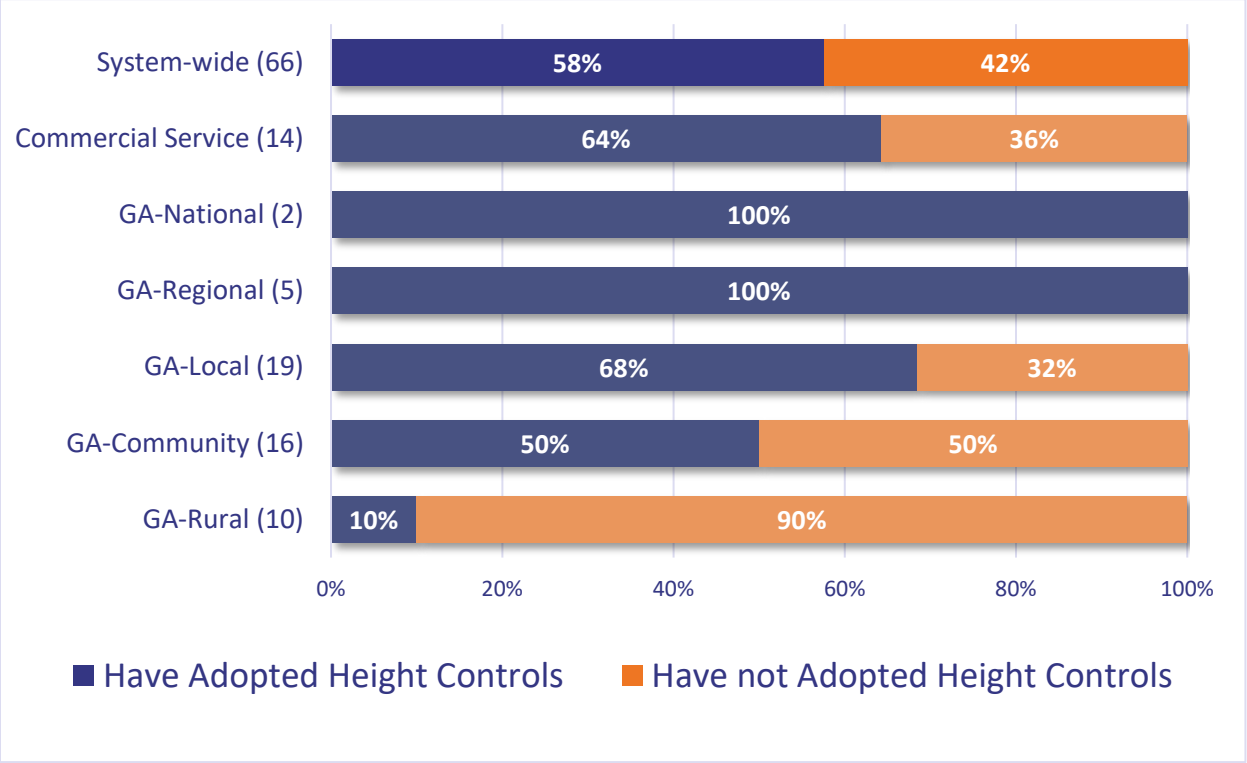
[2] In some cases, a community may impact more than one jurisdiction such as multiple cities and/or counties and may or may not impact jurisdictions beyond those of the airport sponsor. Airports were asked whether their local zoning authority adopted land use and height regulations during the inventory effort, but specific details on the number of impacted jurisdictions was not obtained from all airports.

Figure 6.3. Percent of Airports by Classification with Land Controls



Source: 2018 Inventory & Data Form

Figure 6.4. Percent of Airports by Classification with Height Controls



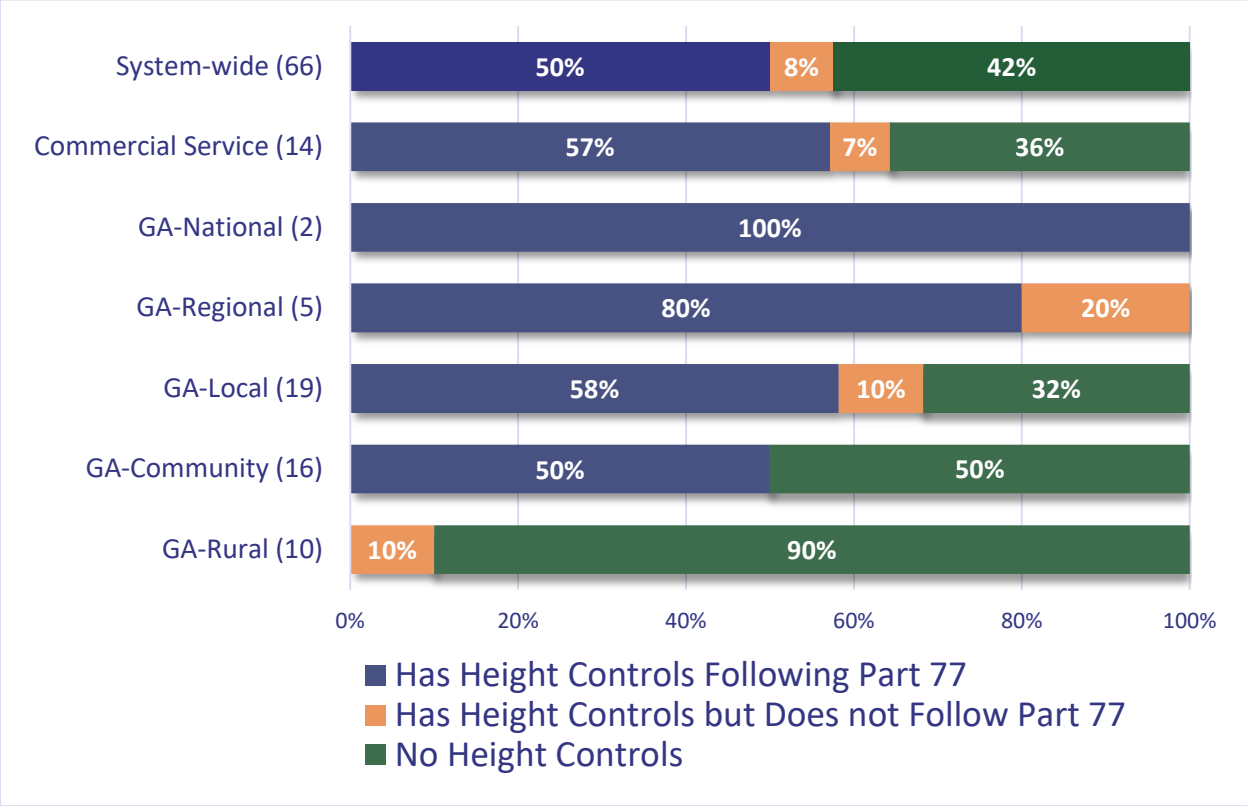
Source: 2018 Inventory & Data Form

To regulate the National Airspace System (NAS), the FAA enacted Title 14 of the Code of Federal Regulations (CFR), Part 77: Safe, Efficient Use, and Preservation of the Navigable Airspace (Part 77). 14 CFR Part 77 established the requirements and means to evaluate the effect of the height of proposed construction or alteration of an existing structure on the safe and efficient use of navigable airspace, as well as navigational and communication facilities and equipment. To accomplish this, 14 CFR Part 77 established a set of "imaginary surfaces" around an airport's runways. Development proposed within these surfaces is subject to FAA notification and review to determine if the development (height) poses a threat to the safe navigation of the NAS.

Airports that indicated their local zoning authority has adopted height zoning were also asked if the height zoning follows 14 CFR Part 77 requirements. Local adoption of height zoning requirements that mimic federal requirements help align compatible land use efforts at multiple levels of government. Additionally, it can provide for the enforcement of FAA findings if the FAA determines a development to be a hazard (the FAA can determine a development to be a hazard, but they cannot prohibit the development).

Figure 6.5 shows the percent of airports that reported their zoning authority's height zoning follows Part 77. System-wide, 50 percent of airports have height zoning that follows the requirements set in Part 77, whereas eight percent of airports have height zoning that does not follow 14 CFR Part 77 and 42 percent do not have height zoning. Commercial service airports follow closely to the system-wide performance with 57 percent having these height controls, seven percent with height controls that do not follow 14 CFR Part 77, and 36 percent that do not have height controls. All GA-National airports have height controls which follow Part 77 requirements. GA-Rural airports report 10 percent of airports having height controls that do not follow 14 CFR Part 77 and 90 percent without height zoning.

Figure 6.5. Percent of Airports by Classification with Height Zoning Following Part 77



Source: 2018 Inventory & Data Form

Additionally, a high-level evaluation was conducted to understand existing land use conditions surrounding Colorado system airports. This evaluation identified incompatible land uses within each airport's 14 CFR Part 77 imaginary surfaces to provide supplementary information about developments taking place near airports. Of the 41 airports system-wide that indicated they have some form of land use or height controls, all were identified as having some form of incompatible use and/or potential height issues located within their established 14 CFR Part 77 surfaces. Per the evaluation, the incompatible land uses that were identified include the following categories: residential developments, major developments, water bodies, and landfills. The full analysis and findings for incompatible land uses within 14 CFR Part 77 is provided in **Appendix A. Land Use Evaluation**.

6.2.1.4. Percent of NPIAS Airports that Meet Current FAA Design Standards Under AC 150/5300-13A

FAA established airport design criteria to facilitate safe operations. These design criteria are continually evaluated by the FAA's technical teams to determine necessary changes based on changes to aircraft including new aircraft that may be faster or have wider wing spans or other equipment, and to increase operational safety for aircraft and their pilots and passengers. Most recently, the FAA addressed potential risk areas resulting from previously established standards, especially taxiway geometries, Runway Safety Areas (RSAs), and Runway Protection Zones (RPZs). The following section analyzes these standards related to NPIAS-only CASP airports. Non-NPIAS airports were excluded from

this analysis because they are not federally obligated to meet the standards, and as such, do not receive federal funding to meet the FAA standards.

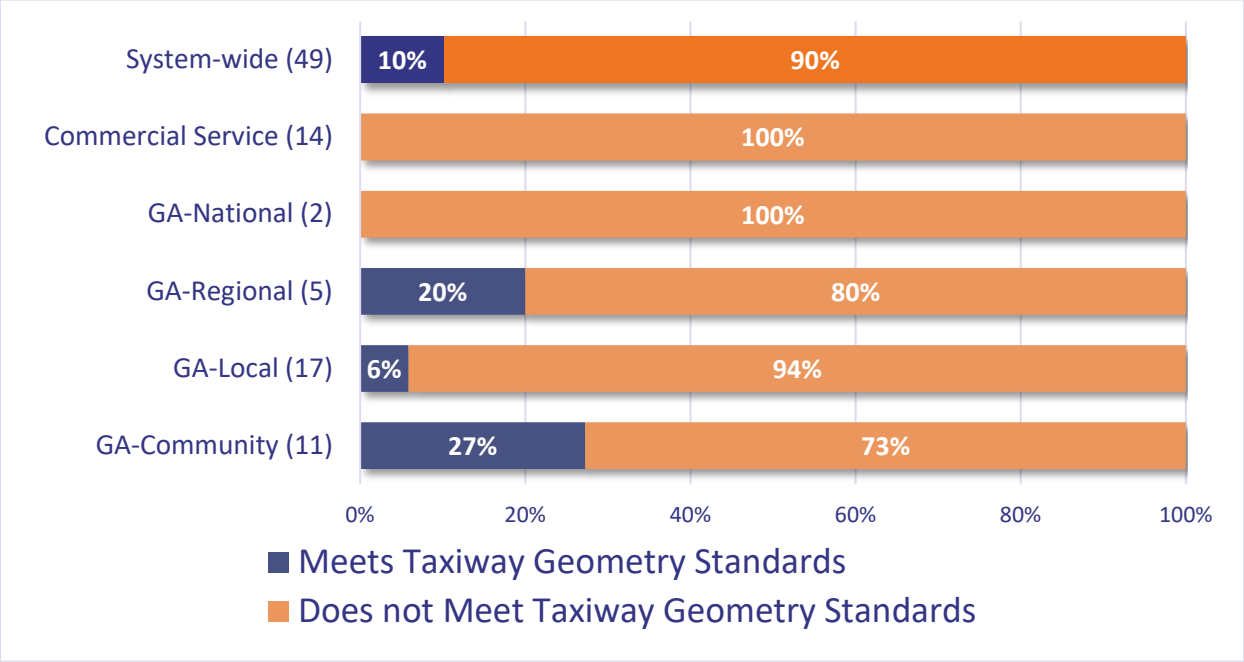
One of the implemented new standards focuses on mitigating potential "hot spots" or areas of the airfield in which design may create a higher risk of or incursions or loss of separation. Subsequently, taxiway design standards were updated by the FAA in 2014 to reflect standards meant to increase pilots' situational awareness when navigating their aircraft across airports. These new standards are in sharp contrast to the historical taxiway design standards that have been used for many years in airport planning and design. This results in many airports not meeting the current FAA taxiway design standards which are not specific to Colorado. It is important to note that many of these issues are only due to more recent changes in FAA design criteria than when the infrastructure was originally planned and constructed. Airport taxiways were reviewed to assess the presence of the following three design concerns on their taxiways that were noted in the FAA's AC 150/5300-13A, Change 1 (updated in February 2014):

- Direct access to the runway
- Three-node intersection
- Wide expanse of pavement

Airports that receive federal funding are recommended to meet the FAA's standards as outlined in their ACs, however, if FAA funding is used to implement projects, airports are required to comply with FAA airport design standards as part of their grant assurances. For this analysis, all taxiways at NPIAS airports were reviewed to assess the existence of the three design concerns listed above. If any taxiway on the airfield was identified as having one of the three design concerns, the airport was considered as not meeting the FAA taxiway design standards for this PM. Many airports have more than one taxiway serving the airfield. While each taxiway was evaluated, the airport was considered to meet the current FAA design standards only if they did not have any instances of the three previously identified design concerns. The intent of this analysis was to identify the airports that require future airfield geometry updates. The FAA has funded and continues to fund taxiway geometry re-designs, primarily as part of other projects, not as stand-alone projects to address a singular taxiway geometry issue. Large-hub commercial service airports were given priority from the FAA, as well as others that were noted to have numerous hot spots or have experienced a high number of runway incursions that may be associated with taxiway design. It is not a surprise that many general aviation airports in Colorado, as well as in the U.S., have non-standard taxiways on their airfields given that this standard was updated only recently and is significantly different to prior standards on which many airports were developed.

Based on an analysis conducted using Google Earth and airport layout plans (ALPs), 10 percent of NPIAS airports system-wide were identified as meeting current standard taxiway geometries. Of all Commercial Service, GA-National, and GA-Regional airports, only one meets current standard taxiway geometry. Twenty-seven percent of GA-Community airports have standard taxiway geometries which represents the most in any classification. **Figure 6.6** summarizes the results of this analysis system-wide and by airport classification for the NPIAS airports.

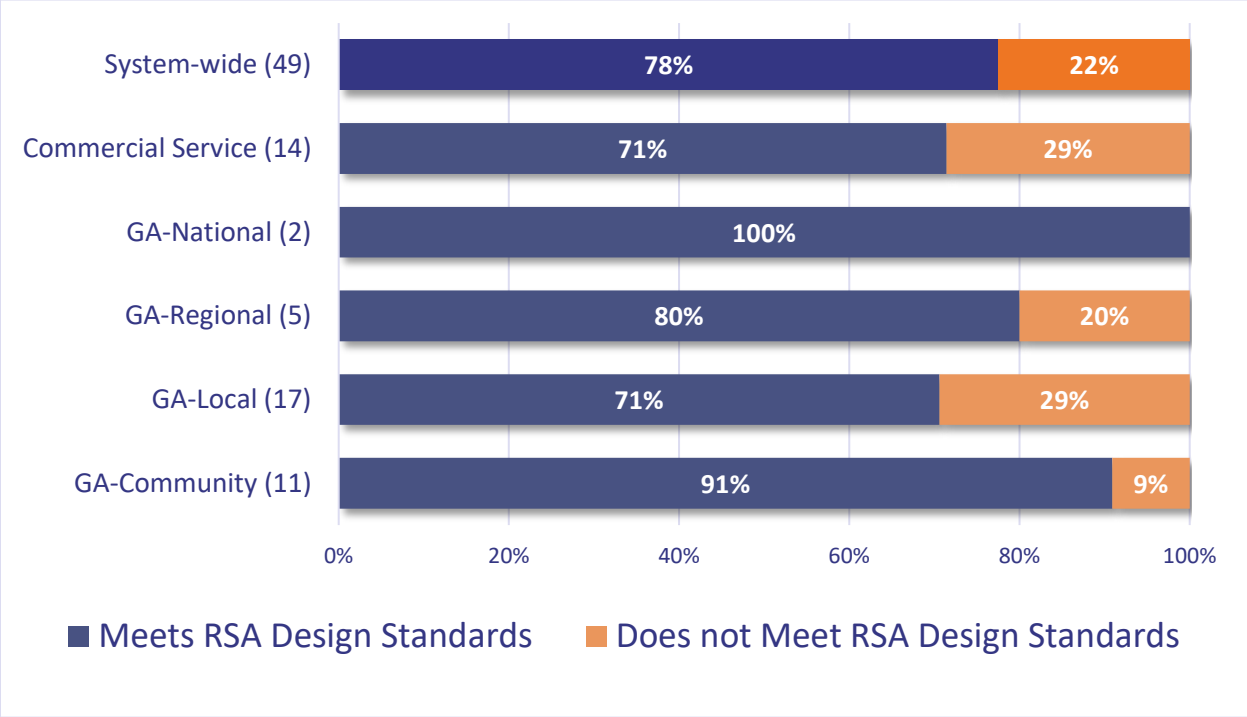
Figure 6.6. Percent of NPIAS Airports that Meet Current FAA Taxiway Geometry Standards



Note: GA-Rural airports were not included in the chart as there are no NPIAS airports in this classification.
Sources: ALPs; Google Earth; Kimley-Horn, 2019

Additional analysis included examination of the airports' RSAs. RSAs provide a buffer area around the runway to protect aircraft that may veer off the runway. For this analysis, an RSA was considered as meeting design standards if it appeared to be graded and clear of obstructions within the dimensions associated with the primary runway's design code using data and imagery available from airport master plans, ALPs, and Google Earth. The analysis revealed that 78 percent of NPIAS system airports have primary runways that meet FAA RSA design standards. **Figure 6.7** presents the NPIAS system-wide results, including by airport classification, related to the RSA component of the PM.

Figure 6.7. Percent of NPIAS Airports that Meet RSA Standards



Note: GA-Rural airports were not included in the chart as there are no NPIAS airports in this classification.
Sources: Airport master plans; ALPs; Google Earth; Kimley-Horn, 2019

Finally, an analysis was conducted to examine the existence of incompatible uses and objects within each airport's runway protection zones (RPZs) as another metric of meeting this PM. RPZs represent trapezoidal safety buffer areas extending out from the end of each runway end. Having airport-controlled RPZs free from incompatible uses and objects reduces the risk during takeoff and/or landing of an aircraft near runway ends. System-wide, public roadways are the most common incompatible uses existing within RPZs with 51 airports having some sort of roadway in this defined area. Fifteen airports were identified to have buildings and three were identified as having another incompatible land use present. The full analysis related to objects or obstructions and/or incompatible land uses within each CASP airport's runway RPZ is provided in **Appendix A. Land Use Evaluation**.

6.2.2. System Indicators

The following section discusses the results of SIs associated with the safety and efficiency goal category. These SIs include:

1. Percent of airports with adequate crosswind coverage
2. Percent of airports that meet runway length requirements for existing critical aircraft
3. Percent of airports that have a formalized process for receiving, managing, and responding to on-/near-airport Unmanned Aircraft Systems (UAS) use requests
4. Percent of airports with the level of activities to warrant an Air Traffic Control Tower (ATCT)
5. Percent of communities with emergency responders that have basic training in Aircraft Rescue and Firefighting (ARFF)

6. Percent of airports that support Aerial Firefighting
7. Percent of airports that support medical/emergency evacuation aircraft

6.2.2.1. Percent of Airports with Adequate Crosswind Coverage

Another important component of evaluating a safe and efficient airport system is understanding the level of crosswind coverage at system airports. FAA planning standards indicate that an airport should be capable of operating under allowable wind conditions at least 95 percent of the time. If crosswind coverage is lower than 95 percent, a crosswind runway may be needed. Crosswind coverage at CASP airports was determined using the FAA's Airport Data and Information Portal (formerly known as the Airports Geographic Information System or AGIS) wind coverage tool. This tool uses the crosswind component associated with each airport's runway design code (RDC) (shown in **Table 6.1)** for the primary runway, and wind data obtained from the airport's weather reporting station. If an airport did not have on-site weather reporting, the weather station from the next closest airport was used.

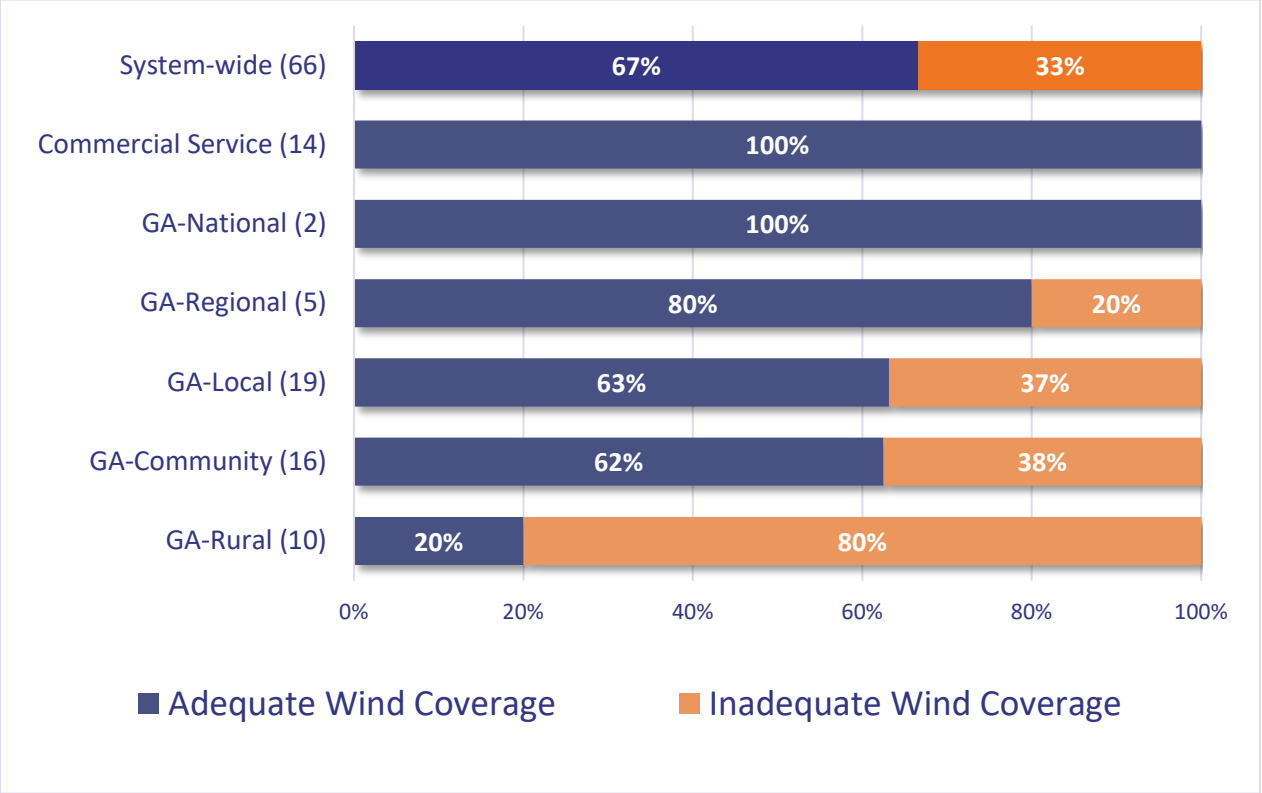
Table 6.1. Allowable Crosswind Component per RDC

RDC	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 C-III, D-I through D-III	16 knots
A-IV and B-IV, V-IV through C-VI, D-IV through D-VI	20 knots
E-I through E-VI	20 knots

**Includes A-I and B-I small aircraft.*
Source: FAA AC 150/5300-13A, Change 1

System-wide, two-thirds of primary runways at CASP airports have adequate crosswind coverage which includes all Commercial Service and GA-National airports. Adequate crosswind coverage decreases by classification type. Of the 52 GA airports in the system (GA-National through GA-Rural), 58 percent have adequate crosswind coverage. Of the 17 Non-NPIAS airports in the CASP, seven (41 percent) have adequate crosswind coverage. **Figure 6.8** summarizes the system-wide results, and by classification, for adequate crosswind coverage.

Figure 6.8. Percent of Airports by Classification with Adequate Crosswind Coverage



Sources: FAA AC 150/5300-13A, Change 1; FAA Wind Analysis Tool, 2019; Kimley-Horn, 2019

6.2.2.2. Percent of Airports that Meet Runway Length Objectives for Existing Critical Aircraft

A runway's design should be based on the most demanding aircraft that regularly uses the runway, defined as 500 annual aircraft operations. Longer and wider runways accommodate more demanding aircraft that need longer distances to accelerate on takeoff and decelerate on landing. Meeting the runway length need enhances safety for pilots, passengers, and people and property on the ground. Runway length for primary runways at CASP airports were determined based on facility and service objectives criteria as shown in **Table 6.2**.

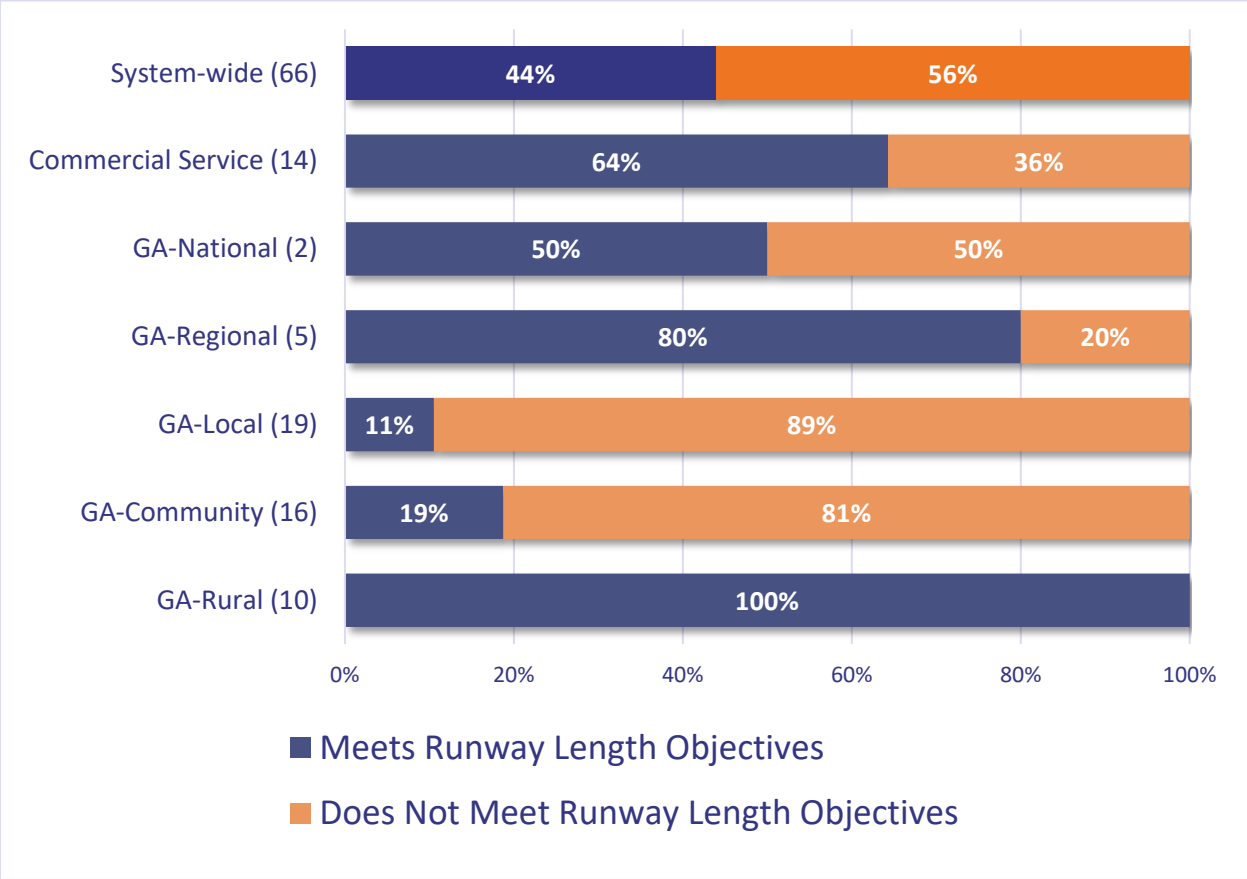
Table 6.2. Runway Length Objectives by Airport Classification

Airport Classification	Runway Length Objective
Commercial Service	Align with Master Plan
GA-National	Align with Master Plan
GA-Regional	Align with Master Plan
GA-Local	Accommodate 100 percent of small aircraft adjusted for elevation and mean daily maximum temperature of the hottest month
GA-Community	Accommodate 95 percent of small aircraft adjusted for elevation and mean daily maximum temperature of the hottest month
GA-Rural	Maintain existing

Sources: CDOT Division of Aeronautics, 2019; FAA AC 150/5325-4B, Runway Length Requirements; Kimley-Horn, 2019

System-wide, 44 percent of airports meet primary runway length objectives based on the facility objectives established for the 2020 CASP. Sixty-four percent of Commercial Service, 50 percent of GA-National, and 80 percent of GA-Regional airports have primary runways that meet the length objectives identified in the 2020 CASP. Eighty-nine percent of GA-Local and 81 percent of GA-Community airports do not meet the length objectives. It should be noted that many Colorado airport runway length objectives based on FAA guidance are greater than those for similar airports in other states or regions due to the state's high elevation and high temperature climate. **Figure 6.9** presents the system-wide results, and by airport classification, whose primary runways meet the CASP objective length.

Figure 6.9. Percent of Airports by Classification that Meet Runway Length Objectives



Sources: FAA AC 150/5325-4B, Runway Length Requirements; Airport master plans; ALPs; Kimley-Horn, 2019

6.2.2.3. Percent of Airports that Have a Formalized Process for Receiving, Managing, and Responding to on-/near-airport Unmanned Aircraft Systems (UAS) Use Requests

The implementation of UAS for recreational and commercial use has increased substantially in the last five years and is anticipated to continue growing around the world[3]. As more UAS are integrated into the national airspace system (NAS) the need to implement formal processes to manage UAS on and near airports becomes imperative to the safety of airport users, UAS operators, and the public. Enacting a

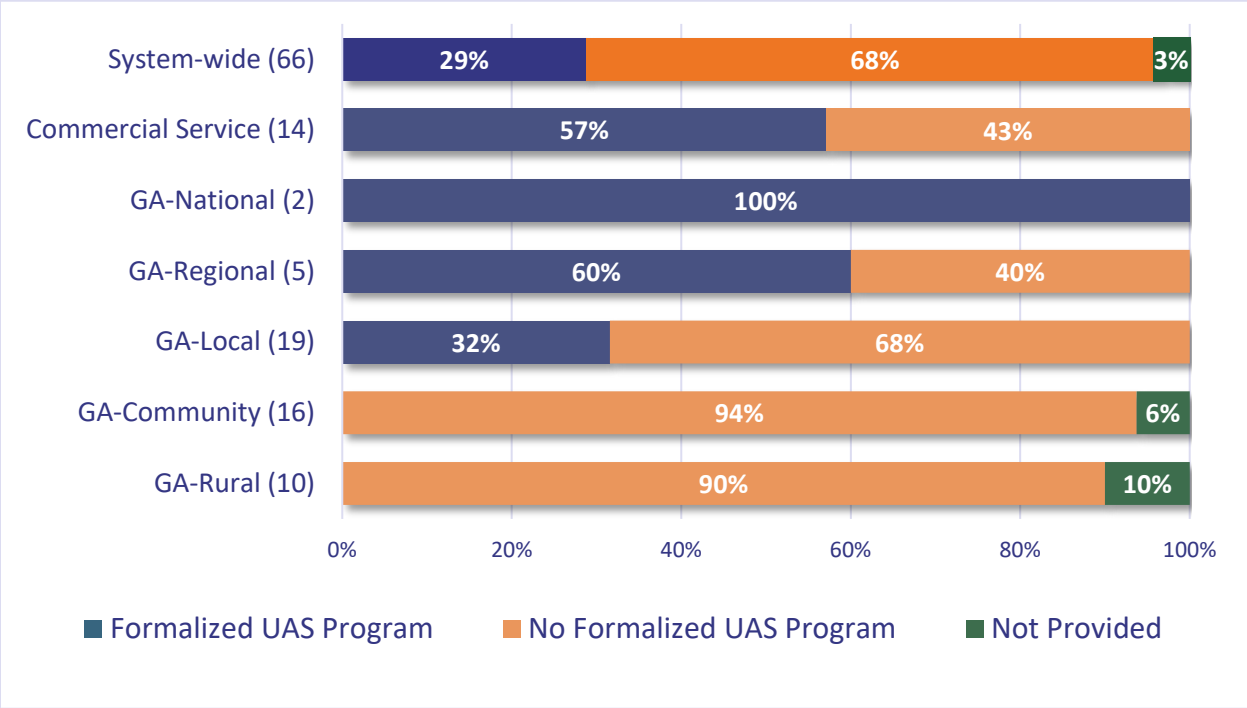
[3] FAA Aerospace Forecast FY 2019-2039: https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/FY2019-39_FAA_Aerospace_Forecast.pdf

set of procedures to conduct safe UAS operations allows airports to actively monitor the existence of UAS near or within the airport's utilized airspace, effectively reducing the risk of collisions with aircraft.

As mentioned in **Chapter 2. Inventory of System Condition**, to better understand where UAS activity is occurring at or near CASP airports, and if those facilities have formal policies or processes to monitor, limit, or prohibit activity, airport managers were asked if their airport has a formal process to receive, manage, and respond to on/near-airport UAS use requests (e.g., AirMap).

Twenty-nine percent of CASP airports reported having a formalized UAS process. All GA-National airports and over half of GA-Regional and Commercial Service airports have a formalized UAS process. Thirty-two percent of GA-Local airports and none of the reporting GA-Community or GA-Rural airports have a formalized UAS process. System-wide, three percent of airports did not report this information all of which were Non-NPIAS airports in the GA-Community and GA-Rural airport classifications. **Figure 6.10** displays the system-wide results of this analysis.

Figure 6.10. Percent of Airports by Classification with a Formal UAS Process



Source: 2018 Inventory & Data Form

6.2.2.4. Percent of Airports with the Level of Activities to Warrant an Air Traffic Control Tower (ATCT)

As mentioned in **Chapter 2. Inventory of System Condition**, ATCTs are facilities located at some airports that facilitate the safe and efficient guidance of aircraft within the airport environs. Colorado has nine airports with ATCTs which include the following six Commercial Service and three GA airports:

- Denver International (DEN)
- Colorado Springs Municipal (COS)
- Aspen-Pitkin County (ASE)
- Eagle County Regional (EGE)
- Grand Junction Regional (GJT)
- Pueblo Memorial (PUB)
- Centennial (APA)
- Rock Mountain Metropolitan (BJC)
- Colorado Air and Space Port (CFO)

ATCTs are typically provided at airports that have high annual aircraft operation levels or complex operating environments. When an airport reaches an operational threshold, which is based on a variety of factors (e.g., number of operations and by type, number of runways, etc.), an ATCT may be needed to increase the safety and efficiency of aircraft moving within the airport environs. In Colorado, there are also factors such as seasonality that significantly affect an airport's activity compared to examining only annual operational activity.

ATCTs are expensive facilities that many nonprimary airports in the nation need but struggle to afford. CDOT Division of Aeronautics partnered with the FAA to implement the Colorado Remote Tower Project (CRTP) that is aiming to eliminate the need for expensive ATCT building infrastructure and operating costs, but still provide ATCT guidance and services. The remote tower uses a network of panoramic video and various static cameras securely mounted on steel masts on either end of a runway, as well as near the mid-point. The cameras give air traffic controllers a full 360-degree view of the airfield. The camera and radar-based surveillance data are fed to a remotely-located control center.[4] The remote tower is one of two being developed and tested in the U.S., but Colorado's is the first to combine the camera data reflecting ground activity with radar information, further enhancing the data available that can be provided to air traffic controllers increasing safety and efficiency.

In 2015, CDOT and the FAA undertook a site selection process to evaluate potential location(s) to test and assess remote air traffic technology. The airports evaluated included Aspen-Pitkin County (ASE), Durango-La Plata County (DRO), Northern Colorado Regional (FNL), Greeley-Weld County (GXY), and Montrose Regional (MTJ). FNL was ultimately selected for the CRTP based on site selection criteria that included type of airspace, existing primary and secondary surveillance coverage, daily operational level including aircraft mix, airport movement complexity, available instrument procedures, proximity to Denver and local FAA staff, accessibility for out of state travelers to reach the airport during testing, and stakeholder support. **Figure 6.11** presents the site selection matrix as reported in CDOT Division of Aeronautics' Colorado Site Decision Paper.

[4] CDOT Division of Aeronautics Remote Tower Project - https://www.codot.gov/programs/remote-tower/TheProject

Figure 6.11. Remote Tower Project Site Rankings

	Candidate Airports				
Criteria	Aspen	Durango	Fort Collins	Greeley	Montrose
Airspace Type	2	1	1	1	1
Existing Primary Surveillance Coverage	1	0	2	2	0
Existing Secondary Surveillance Coverage	0	2	1	1	2
Daily Operational Level	2	1	2	2	1
Aircraft Mix	1	1	2	1	1
Airport Movement Complexity	2	2	1	0	0
Instrument Procedures	1	1	1	1	1
Proximity to Denver & Local FAA	1	1	2	2	1
Accessibility for Out of State	1	1	2	2	1
Stakeholder Support	0	2	2	1	1
Weighted Overall Airport Score	**1.3**	**1.4**	**1.7**	**1.3**	**0.9**

Ranking	
	0= does not meet reqirements
	1= meets requirements
	2= excedes requirements

Source: CDOT Division of Aeronautics, 2015

CDOT Division of Aeronautics is interested in expanding the CRTP upon FAA certification of the FNL system. Given this program is in testing, FAA criteria for eligibility to establish an ATCT are expected to change once remote towers are proven. The current criteria are stringent, even to join the Federal Contract Tower Program, which is staffed by contract controllers, not FAA employees. There is a benefit-cost ratio that must be analyzed and criteria such as documented actual traffic counts and determining the present value of a visual flight rule (VFR) tower with the costs of a VFR tower over 15 years. The ratio of the benefits from the tower's operation compared to the tower's cost must exceed 1.0 to be considered. A significant factor in the tower's operational costs include the investment in facilities and equipment, as well as staffing, maintenance, supplies, and services. Because remote towers have the capability to service multiple airports from a single location, development and operating costs would be greatly reduced compared to traditional ATCTs.

CDOT's initial site selection analysis shows that DRO, GXY, and ASE could be the next candidate(s) for the CRTP, however, other airports may be considered once the FNL tower is completely certified and operational. The 2020 CASP examined future annual aircraft operations projections compared to annual capacity estimates developed as part of the project (and discussed in **Chapters 7** and **8**) as a first step in examining airports that may need to be considered purely from an operational efficiency and capacity perspective. These future needs are evaluated in **Chapter 8. Future System Performance**.

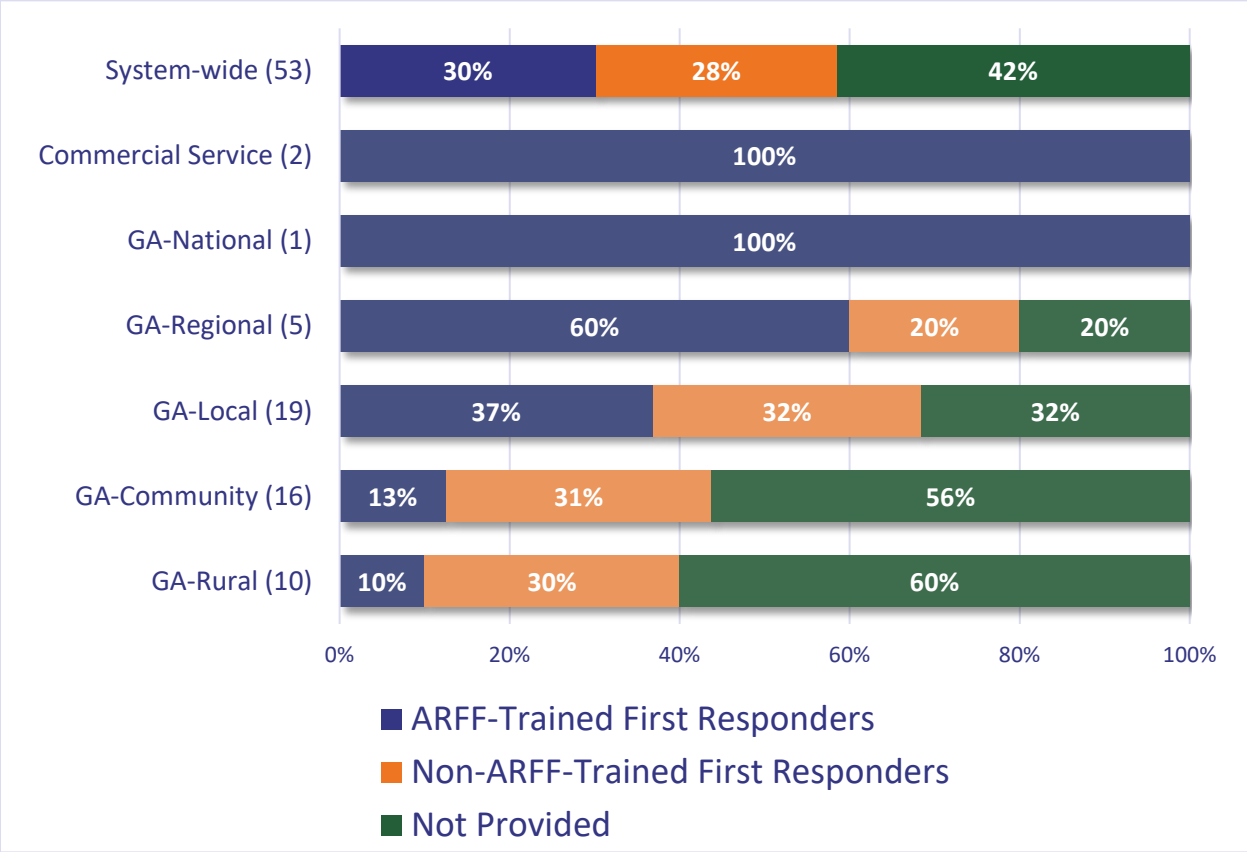
6.2.2.5. Percent of Communities with Emergency Responders that Have Basic Training in Aircraft Rescue and Firefighting (ARFF)

Airports complying with Title 14 of the Code of Federal Regulations (CFR) Part 139 are required to have emergency response equipment (called Aircraft Rescue and Firefighting [ARFF] equipment) and personnel to respond to aircraft emergencies. As of May 29, 2019, and according to FAA's Part 139 Airport Certification Status List, there are 13 Colorado airports that are certified as Part 139 and

therefore required to have ARFF equipment and trained personnel[5]. There are 53 CASP airports that are not required to have facilities and/or trained personnel at the airport and as such, those airports were asked during on-site visits to determine if local, off-airport first responders were trained to respond to airport and aircraft incidents.

Of the 13 Part 139 airports, 12 are classified as Commercial Service and one is classified as GA-National. Since Part 139 airports are required to have on-airport ARFF, they have been removed from this analysis. System-wide (not including Part 139 airports), 30 percent of airports have off-airport ARFF-trained first responders, 28 percent do not, and 42 percent of airports did not provide a response to this question. One hundred percent of Commercial Service airports (2 out of 2), and 60 percent of GA-Regional airports have off-airport emergency responders that have ARFF training. Over half of GA-Community and GA-Rural airports were unable to answer the question which makes it unlikely that local first responders are ARFF-trained. **Figure 6.12** documents the percent of airports that reported having off-airport first responders who have ARFF training.

Figure 6.12. Percent of Airports by Classification with ARFF-Trained First Responders



Source: 2018 Inventory & Data Form

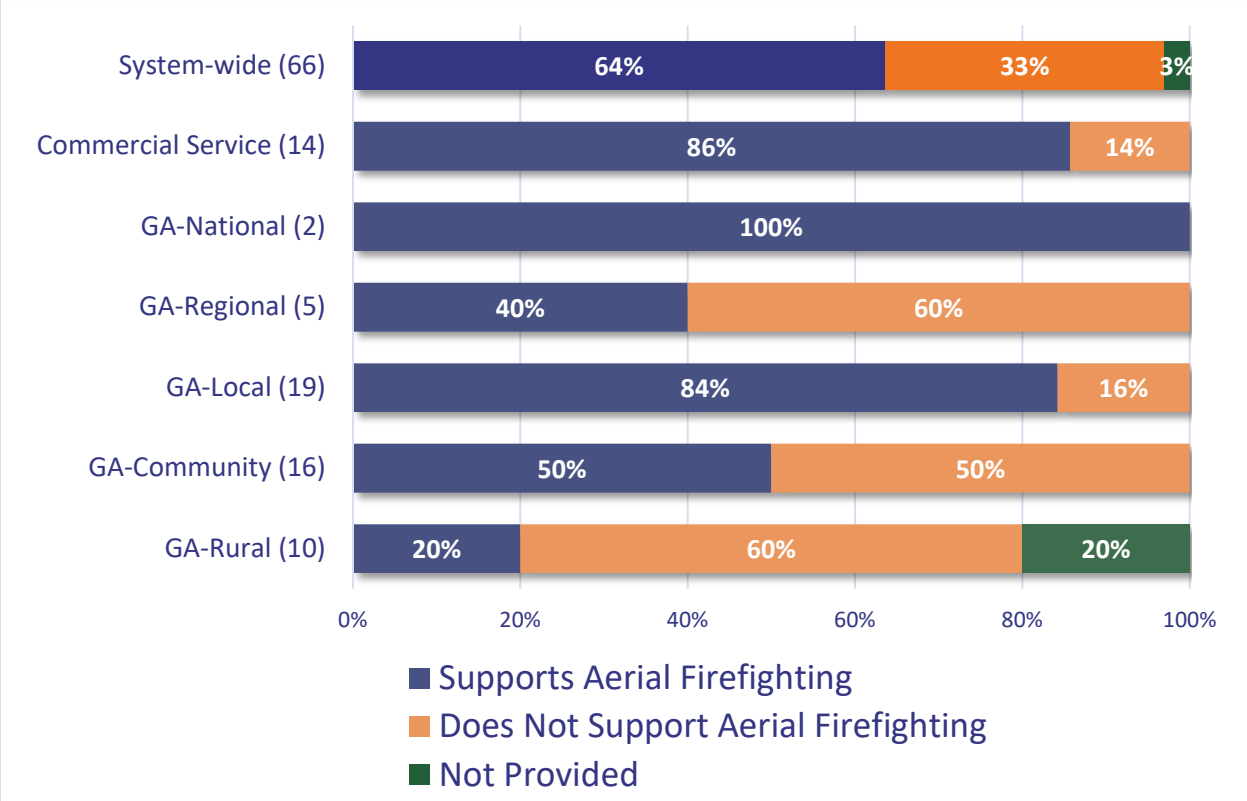
[5] FAA 14 CFR Part 139: Certification of Airports. January 2013. https://www.faa.gov/airports/airport_safety/part139_cert/

6.2.2.6. Percent of Airports that Support Aerial Firefighting

Aerial firefighting operations are often utilized to maintain control during prescribed burns used in wildland management and in containing life-threatening wildfires that have become more prevalent in Colorado and throughout the U.S. Aerial firefighting is conducted using specialized aircraft to support aerial suppression tactics and may be based either permanently or temporarily at nearby airports. In addition to these aerial suppression aircraft, other types of aircraft may be utilized to support aerial firefighting operations such as transporting firefighting personnel, delivering equipment and supplies, and providing important information about the location and behavior of prescribed and/or wildfires. Airports supporting aerial firefighting are key to the deliverance of suppression materials, supplies, and emergency response staff quickly and efficiently.

Based on airport management responses, 64 percent of airports report supporting aerial firefighting activities. GA-Local airports represent the largest portion of this activity type at 84 percent. Twenty percent of GA-Rural airports support aerial firefighting. **Figure 6.13** shows the percent of airports by classification that support aerial firefighting operations on-site as reported by airport managers.

Figure 6.13. Percent of Airports by Classification that Support Aerial Firefighting



Source: 2018 Inventory & Data Form

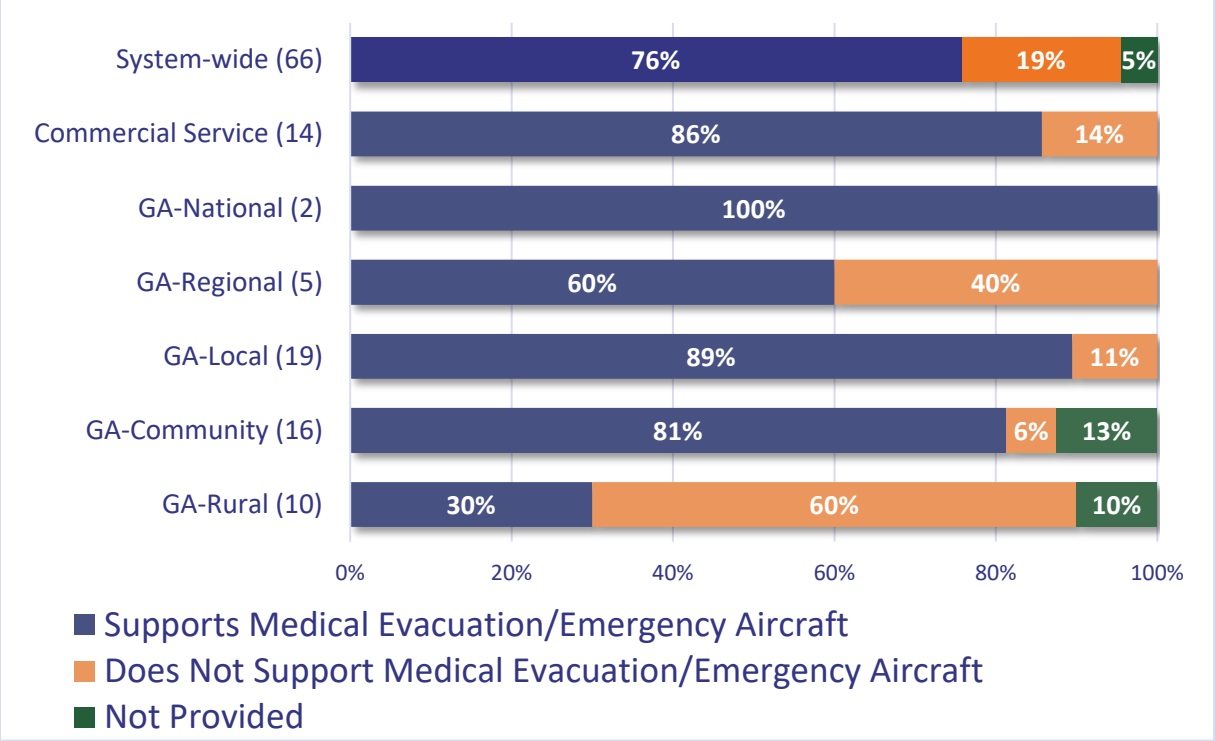
6.2.2.7. Percent of Airports that Support Medical/Emergency Evacuation Aircraft

In addition to supporting firefighting operations, airports which support other medical emergency and evacuation aircraft are critical to rapid delivery of life-saving emergency responders and supplies during situations where time is essential. Specialized aircraft are used to transport personnel to

administer emergency medical services, perform patient transfers to medical facilities, and evacuate individuals from areas not easily accessible by ground transportation. The availability of airports that support these types of aviation activities is crucial to connecting patients and medical providers especially in rural communities where sufficient medical facilities may not exist nearby.

Airports were asked during the inventory process if their airport accommodated these types of operations. As a result, 76 percent of airports system-wide reported supporting medical/emergency evacuation aircraft at their airports. Except for GA-Rural airports, all airport classifications report 60 percent or more of their airports support these types of aircraft. All GA-National airports report accommodating medical/emergency evacuation aircraft. GA-Rural airports reported that 30 percent of their airports support these types of aircraft. **Figure 6.14** shows the results of the survey related to support of medical/emergency evacuation aircraft.

Figure 6.14. Percent of Airports by Classification that Support Medical/Emergency Evacuation Aircraft



Source: 2018 Inventory & Data Form

Americans living in rural communities rely on the local hospital as their principal source of medical care. However, there is a shortage of qualified physicians in rural areas across the country. Rural Partners in Medicine (RPM), based at Rocky Mountain Metropolitan (BJC), has sought to address these shortages by sending specialty surgeons to rural hospitals in Colorado, Nebraska, Wyoming, Missouri, Kansas, Arizona, Nevada, and South Dakota. RPM has partnered with 30 hospitals in the Mountain Region and charters approximately 55 flights per month, making it possible for rural residents to obtain elective surgeries in the community without having to travel to a major city.

6.3. Goal: Access and Mobility

The access and mobility goal is aimed at ensuring Colorado's airport users are able to adequately access the vast range of facilities and services that airports provide. Access ensures that the widest range of users can utilize airport facilities and services at their convenience. Access is especially important during inclement weather which could result in emergency landings or in situations pertaining to emergency response/transportation. Mobility dictates the level of ease in which people can travel to all areas of the state. Airports strengthen Colorado's multi-modal transportation system by acting as points of integration between modes. This integration provides additional services, enhances mobility, and enables travelers to journey beyond the airport's immediate vicinity with greater ease. This goal measures the system's accessibility and mobility by studying its infrastructure, services, and potential reach to the surrounding areas.

6.3.1. Performance Measures

This section discusses the results of the PMs associated with the access and mobility goal category. PMs for this category include the following:

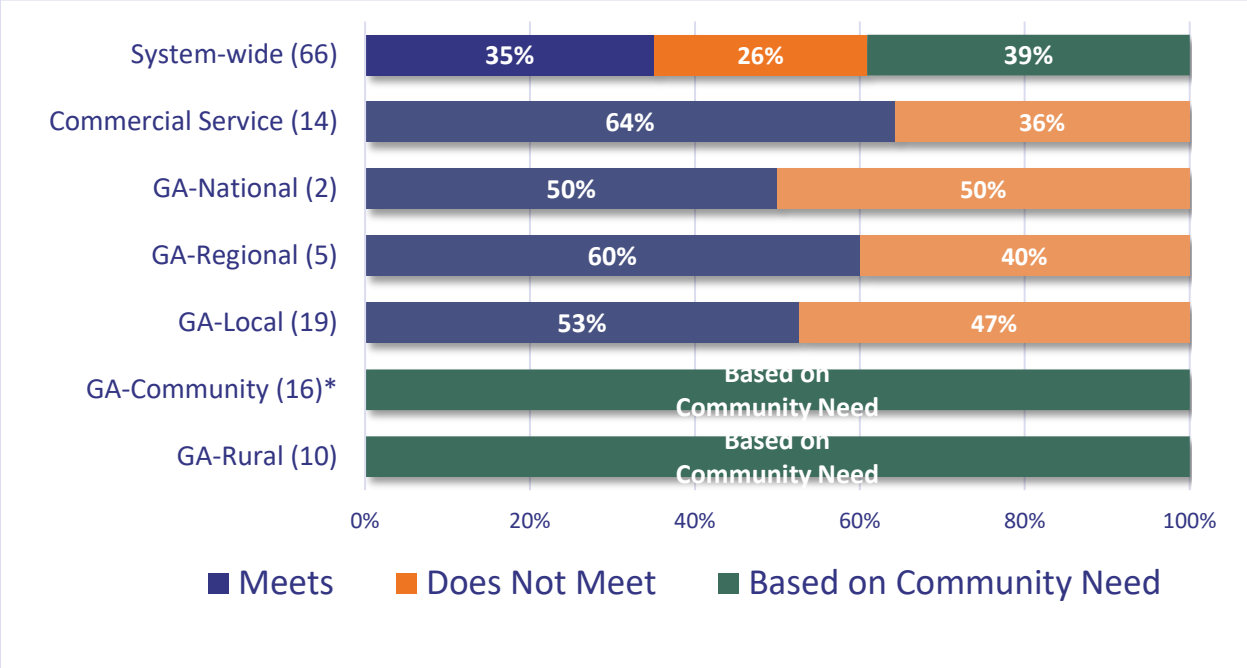
1. Percent of airports with a dedicated Snow Removal Equipment (SRE) building
2. Percent of population within a 30-minute drive time of an all-weather runway
3. Percent of airports with adequate terminal capacity
4. Percent of airports with adequate transient hangar spaces

6.3.1.1. Percent of Airports with a Dedicated Snow Removal Equipment (SRE) Building

Colorado's diverse natural environments and elevations lend to its array of unique climates. Due to this, Colorado airports experience a wide range of weather conditions including heavy snowfall during the winter months. Many Colorado airports accommodate access to world-renowned ski resorts and winter sports attractions. As such, SRE is vital to uninterrupted operations during "less than ideal" winter flying conditions. SRE is critical to keeping hazardous snow, ice and slush from accumulating on airfield surfaces. Providing a dedicated SRE maintenance and storage building ensures that the equipment is always at optimal operational status and prolongs equipment life. SRE equipment that is in optimal condition is essential to keeping airside facilities safe for aircraft movement and activity during the winter months. For this PM, having performance was evaluated consistent with CASP facility and service objectives. Commercial Service, GA-National, GA-Regional, and GA-Local airports objectives are to have a dedicated SRE building. GA-Community and GA-Rural airport objectives for having a dedicated SRE building is based on community need.

Airports were asked if they had a dedicated SRE building. Approximately 35 percent of airports system-wide reported having a dedicated SRE building. Commercial Service, GA-National, GA-Regional, and GA-Local airports have 50 percent or more of airports with a dedicated SRE building. **Figure 6.15** displays the percent of airports by classification that have a dedicated SRE building.

Figure 6.15. Percent of Airports by Classification that have a Dedicated SRE Building



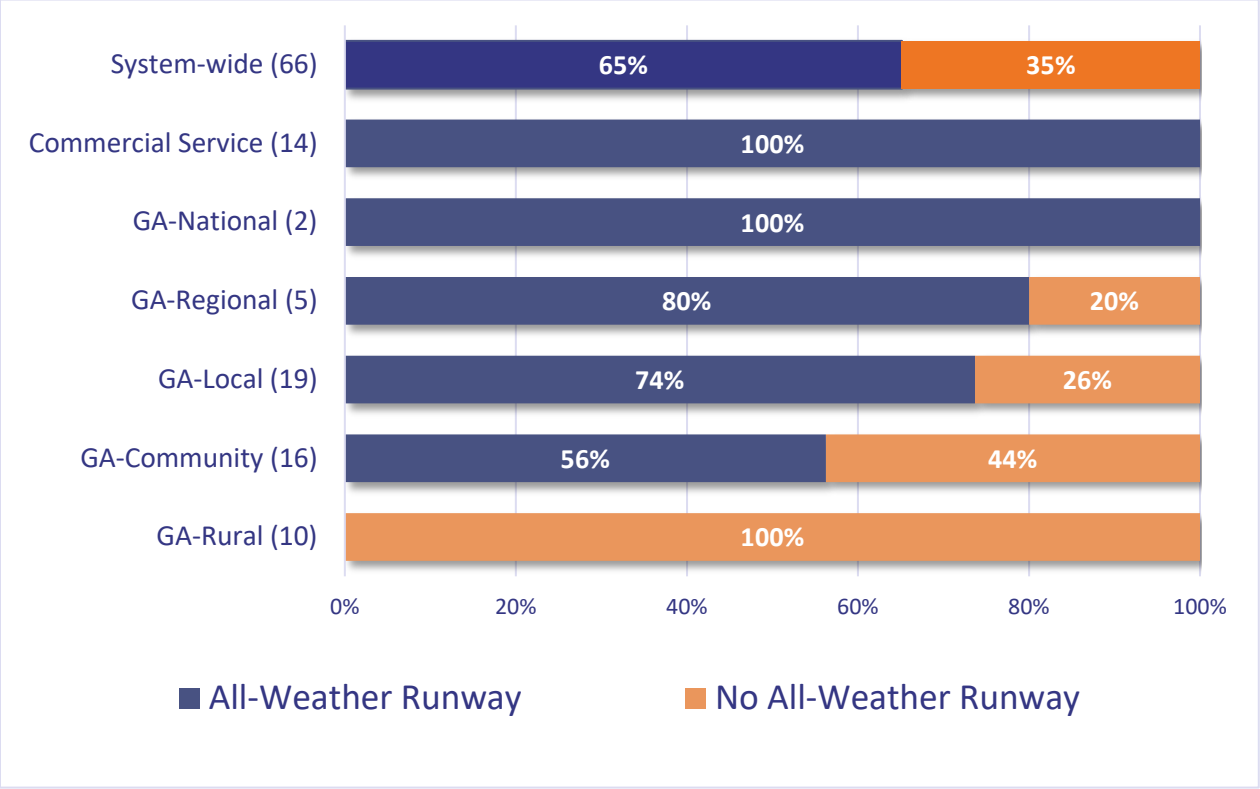
**Note: Six GA-Community airports have dedicated SRE buildings and are reflected in the system-wide analysis.*
Source: 2018 Inventory & Data Form

6.3.1.2. Percent of Population Within a 30-Minute Drive Time of an All-Weather Runway

As noted previously, Colorado experiences a wide range of weather activity which requires airports to accommodate these conditions. The presence of an all-weather runway is often a critical need during emergency response situations during times in which weather negatively impacts access and mobility of alternate transportation modes during the winter months. A runway optimized for these types of conditions are those that are paved, have instrument approach procedures (IAP), and have a weather reporting system present. An all-weather runway increases the operational capacity at airports allowing aircraft to operate during inclement weather.

Based on FAA-sourced material, 65 percent of airports system-wide meet the three elements identified for an all-weather runway. All Commercial Service and GA-National airports have all-weather runways. Eighty percent of GA-Regional, 74 percent of GA-Local, and 56 percent of GA-Community airports support all-weather runways, while none of the GA-Rural airports have the three elements of an all-weather runway. **Figure 6.16** presents the performance of the system and airports by classification that meet the all-weather runway criteria.

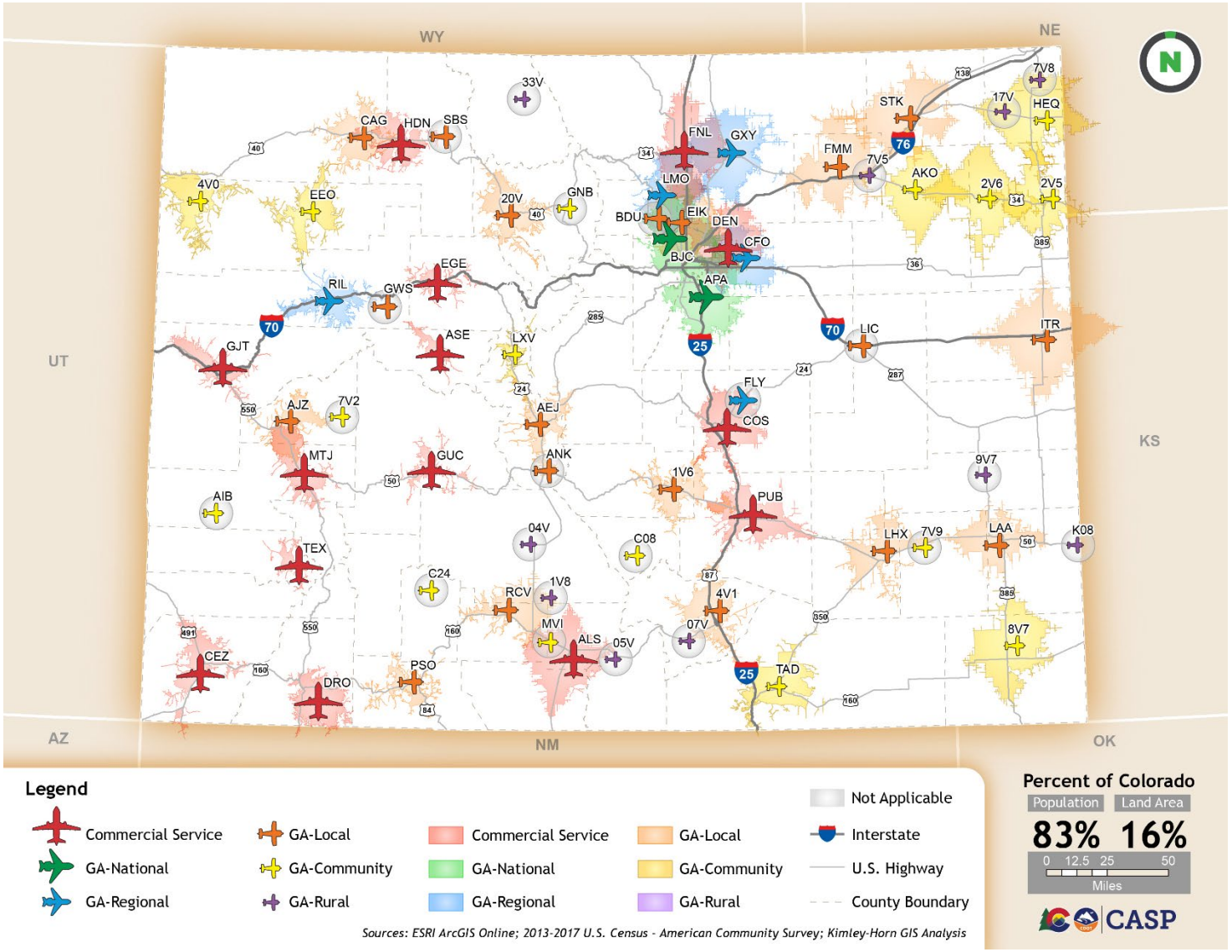
Figure 6.16. Percent of Airports by Classification that have an All-Weather Runway



Sources: 2018 Inventory & Data Form; FAA 5010 Master Record, 2019

Airports are integral gateways for connecting people to all areas of the state. To understand the impact that these airports have on access and mobility in Colorado, the percent of Colorado's population and land area that were within a 30-minute drive time of an airport with an all-weather runway were analyzed in Geographic Information Systems (GIS). As shown in **Figure 6.17**, 83 percent of Colorado's population and 16 percent of the state's land area are within a 30-minute drive of an airport that has an all-weather runway.

Figure 6.17. 30-Minute Drive Time of an Airport with an All-Weather Runway



6.3.1.3. Percent of Airports with Adequate Terminal Capacity

A two-part high-level analysis of terminal and airfield capacities was conducted to gauge the airports' alignment to this PM. The two metrics are so closely related that factors influencing changes in one capacity will directly impact the other. For example, airfield improvements introducing additional operations and enplanements to an airport will affect the terminal's ability to serve more passengers. The following sections expand upon the existing terminal and airfield capacity conditions system-wide.

Commercial Service Terminals

Passenger terminals at commercial service airports are evaluated using a gross terminal size methodology derived from ACRP Report 25. ACRP Report 25 provides a high-level methodology that determines the gross terminal size of an airport dependent on the commercial service airport's terminal type and the number of narrowbody equivalent gates (NBEGs). **Table 6.3** shows the square footage per NBEG sizes included in ACRP Report 25.

Table 6.3. Terminal Sizes Per NBEG by Airport Classification

Airport Terminal	Square Feet/NBEG
Smaller Domestic	15,000 – 18,000
Larger Domestic	18,000 – 24,000
International	28,000 – 40,000

Source: ACRP Report 25, 2010

For the 2020 CASP, the number of gates for each airport was determined through the airport-reported responses to the 2018 Inventory & Data Form and terminal types were substantiated based on hub size. Small hubs were viewed as "Larger Domestic" and nonhub and nonprimary airports were considered "Smaller Domestic." These inputs were used to calculate the minimum gross terminal area size requirements for each airport. Existing passenger terminal buildings were compared to the calculated size requirements to determine if the airport was meeting the PM. As an additional indicator of terminal performance, airports' responses to terminal space deficiencies or delays were considered in the analysis. **Table 6.4** summarizes the terminal capacities for commercial service airports in the CASP.

Table 6.4. Terminal Size Requirements for Commercial Service Airports

Associated City	Airport Name	FAA ID	Airport Designation	Number of Gates	Minimum Terminal Size Requirement (sq. ft.)	Existing Terminal Building (sq ft.)	Meets Terminal Size Requirements	Airport Reports Delays Due to Insufficient Terminal Space
Alamosa	San Luis Valley Regional	ALS	Smaller Domestic	1	15,000	8,400	No	No
Aspen	Aspen-Pitkin County	ASE	Larger Domestic	8	144,000	45,000	No	Yes
Colorado Springs	Colorado Springs Municipal	COS	Larger Domestic	12	216,000	294,495	Yes	No
Cortez	Cortez Municipal	CEZ	Smaller Domestic	1	15,000	3,500	No	No
Denver	Denver International	DEN	International	136	3,808,000	7,496,972	Yes	No
Durango	Durango-La Plata County	DRO	Larger Domestic	3	54,000	37,617	No	Yes
Eagle	Eagle County Regional	EGE	Larger Domestic	6	108,000	120,000	Yes	No
Fort Collins/ Loveland	Northern Colorado Regional	FNL	Smaller Domestic	1	15,000	4,020	No	Yes
Grand Junction	Grand Junction Regional	GJT	Larger Domestic	6	108,000	76,000	No	No
Gunnison	Gunnison-Crested Butte Regional	GUC	Larger Domestic	3	54,000	34,800	No	No
Hayden	Yampa Valley	HDN	Larger Domestic	6	108,000	71,695	No	No
Montrose	Montrose Regional	MTJ	Larger Domestic	4	72,000	35,000	No	Yes
Pueblo	Pueblo Memorial	PUB	Smaller Domestic	2	30,000	23,531	No	Yes
Telluride	Telluride Regional	TEX	Smaller Domestic	1	15,000	20,000	Yes	No

Sources: 2018 Inventory & Data Form; ACRP Report 25; 2010; Kimley-Horn, 2019

Of the 14 commercial service airports, four had existing terminal buildings that met the minimum gross terminal sizes calculated for their airport. Five airports reported experiencing delays or other deficiencies due to insufficient terminal space for passengers.

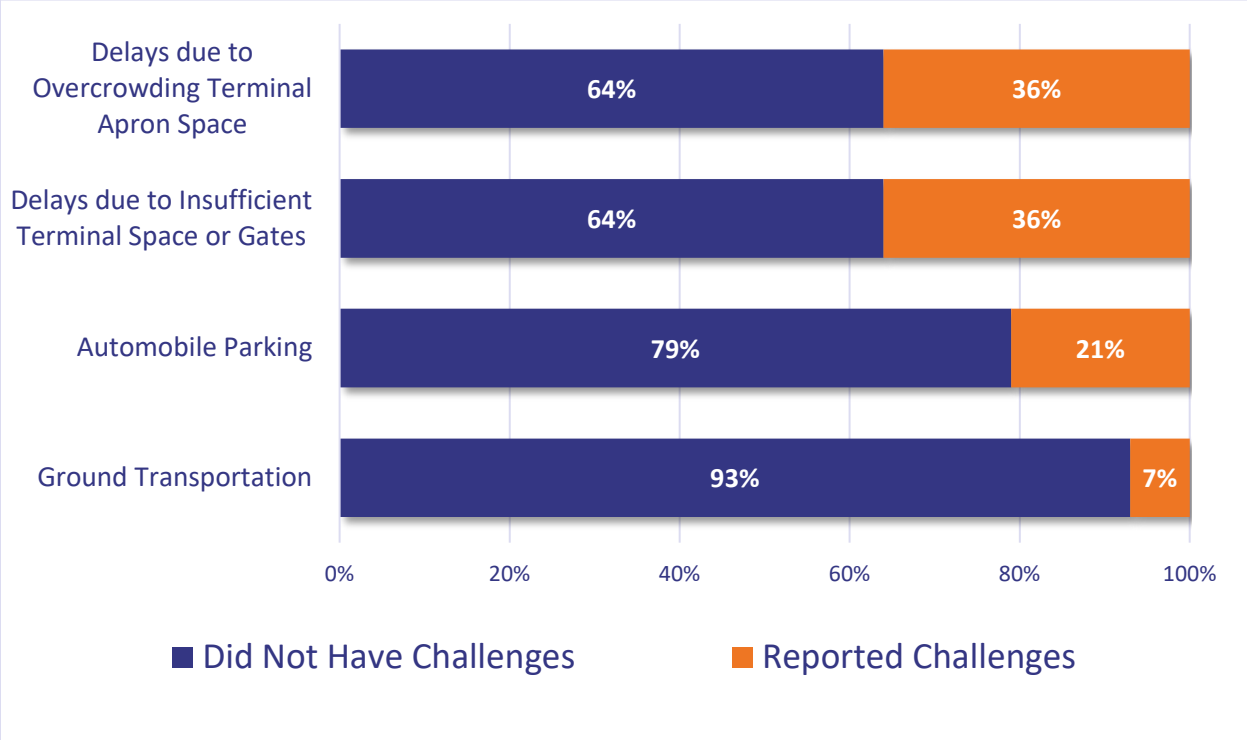
Some of the limitations to this method is that it takes a high-level view of the terminal in its entirety and does not address specific challenges airports may face in terms of space configuration and facility management. For example, an airport may have adequate terminal size, but still experiences heavy delays from lack of adequate facilities or inefficient terminal configurations, especially during peak periods when there are many aircraft on the ground. During this period there are both deplaning passengers and enplaning passengers in the terminal. In Colorado there are also airports that only have a limited number of gates, however, the planes are on the terminal ramp and a single gate may be used to serve multiple aircraft at one time.

To identify some of these factors affecting the adequacy of terminal space, commercial airports were asked to report insufficiencies with their terminal experiences regarding the following areas:

- Ground Transportation
- Automobile Parking
- Delays or Constraints due to Insufficient Terminal Space or Gates
- Delays or Constraints due to Overcrowding Terminal Apron Space

It should be noted that delays due to insufficient terminal space or gates relates to areas used by passengers such as hold rooms, ticketing/check-in, security, bag claim and other related terminal facilities. Delays due to overcrowding terminal apron space are issues associated with insufficient terminal apron space for aircraft. **Figure 6.18** displays the percent of commercial service airports reporting challenges in the above areas. Delays due to overcrowding and insufficient terminal space are the highest reported challenges and affect 36 percent of Commercial Service airports. Automobile parking challenges were reported by 21 percent of airports and ground transportation by seven percent. It should be noted that weather and short staffing of airlines, as well as other factors, can cause delays at airports; however, this level of analysis was not conducted as part of the 2020 CASP.

Figure 6.18. Challenges at Commercial Service Passenger Terminals



Source: 2018 Inventory & Data Form

The highest reported challenges were derived from overcrowding and insufficient space in passenger and terminal apron areas. Much of the qualitative data collected from these airports listed increased flights, aircraft and passenger congestion, and insufficient room to expand as key factors affecting terminals. These types of terminal capacity challenges may be an indicator of growing aviation demand at commercial service airport. It is important to consider these challenges as airports seek to improve airside facilities to support growing aviation demand.

It should be noted that due to the nature of this methodology, individual airports' terminal capacity analyses more accurately determine the facilities, services, and other improvements appropriate to their passenger terminal facilities. Individual airport terminal analyses can be used to determine potential improvements to specific areas of the terminal such as: check-in/ticketing areas, security/passport control, hold rooms, circulation areas, baggage claim, etc. The methodology used in the CASP is very high-level, measuring the airports' abilities to meet one overall size metric to gauge their performance in meeting the PM. This analysis does not analyze key factors such as space configuration, services provided, average wait times, and other indicators unique to each airport in adequately meeting the needs of its users.

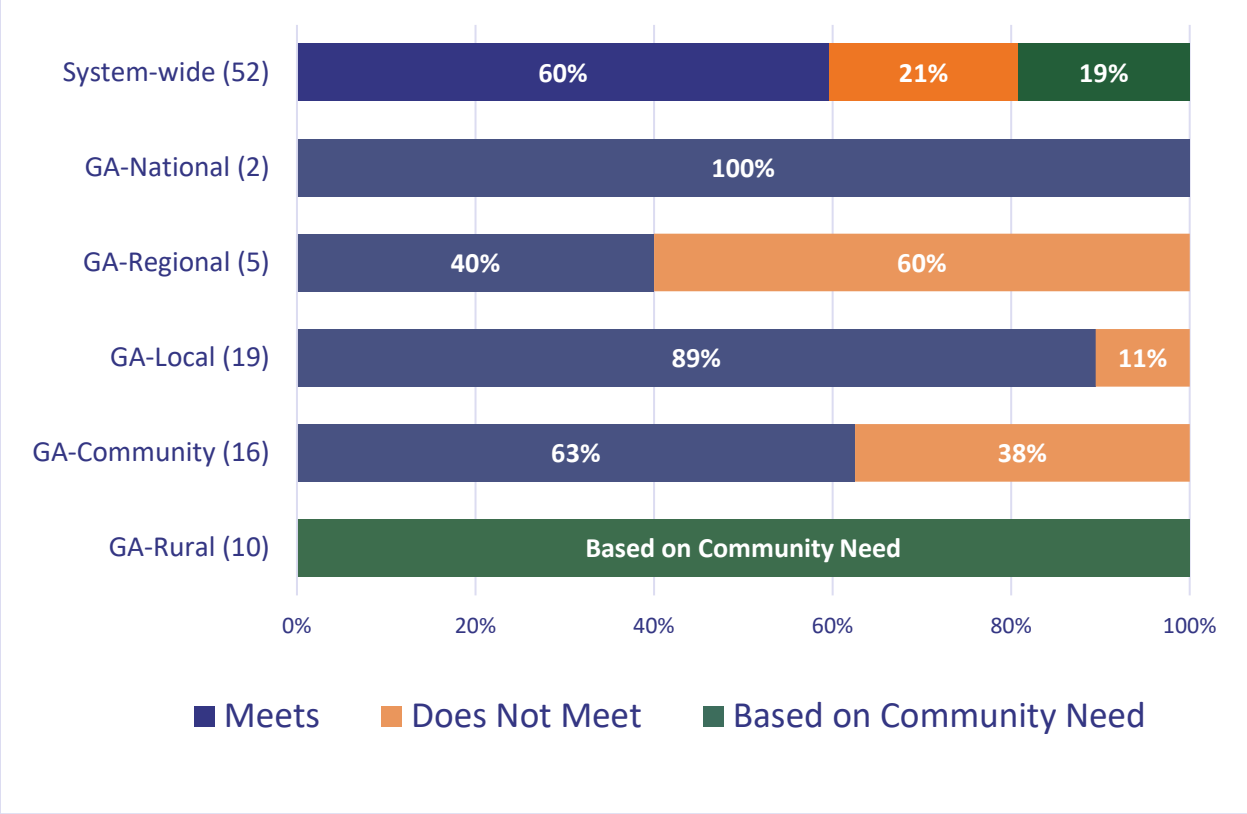
GA Terminals

GA terminals were analyzed based on their facility and service objective which evaluated the ratio of GA terminal square footage to peak hour passengers (GA-National airports) and available amenities to the GA airport user (GA-Regional, GA-Local, and GA-Community airports). The following analysis provides more information related to the ratio of GA terminal building square footage to the number of

peak hour passengers. Amenities that were evaluated include restrooms, flight planning space/rest area, and Wi-Fi availability. Commercial Service airports were not evaluated as they do not have a GA terminal objective. GA-Rural airports do not have a specific terminal objective, but their development should coincide with community needs.

Figure 6.19 presents GA terminal objective performance. System-wide, 60 percent of GA airports have adequate terminal buildings. GA-Local airports make up the largest group of airports with adequate GA terminal buildings. Sixty percent of GA-Regional airports have inadequate terminal buildings.

Figure 6.19. Percent of GA Airports with Adequate GA Terminal Buildings



Sources: 2018 Inventory & Data Form; Various Individual Colorado Airport Master Plans

GA terminal capacities were also examined as an additional analysis. For the 2020 CASP, GA terminal capacities were calculated using terminal size guidelines outlined in the ACRP Report 113. This method takes the number of peak hour operations and multiplies it by 2.5. This number (2.5) signifies an assumed number of airport users (pilots and passengers) that are the result of each peak hour operation. Once the number of peak hour passengers is calculated, it is multiplied by the minimum square feet per person. The ACRP report states adequate terminal size is between 100 square feet - 150 square feet of space per person during the peak hour. One hundred fifty square feet of space per person is the most widely-used metric to determine terminal capacity size guidelines for GA facilities. The formula is shown in the example below:

Example:

Peak Hour Operations: 25

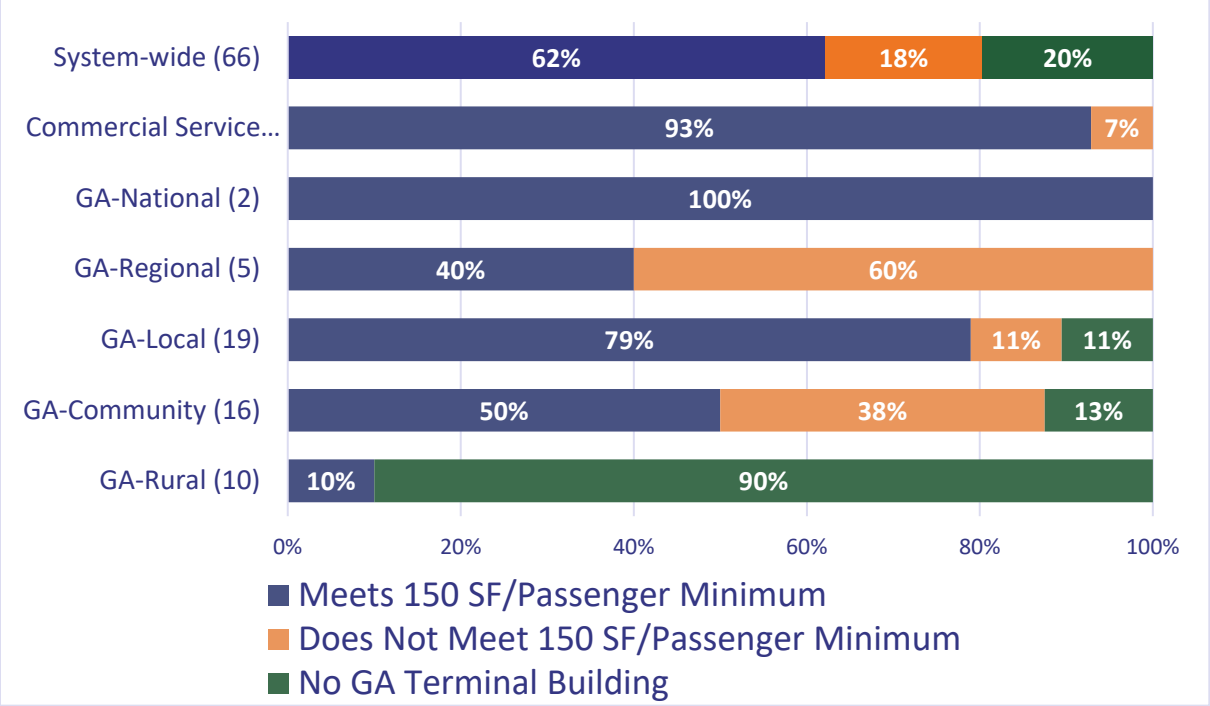
GA Terminal Size = 25 peak hour operations x 2.5 airport users x 150 SF

GA Terminal Size Total Need = 9,375 square feet

Existing GA terminal building sizes, if applicable, were compared to the calculated GA terminal building size needs to determine if it adequately met the ACRP Report 113 size recommendations.

System-wide, 58 percent of GA terminal buildings met the square foot size guidelines established based on guidance from ACRP Report 113. Eighteen percent of GA airport terminal buildings do not meet the size recommendations and 24 percent currently do not have a terminal building. GA-Rural airports are the largest percent of airports that do not have a GA terminal building with 90 percent not providing this facility. GA-Regional airports have the highest percentage of airports with terminal building sizes that are below the ACRP Report 113 size guidelines at 60 percent. Both GA-National airport terminal buildings meet or exceed terminal size recommendations. Seventy-nine percent of GA-Local airports meet the GA terminal building size guidelines. **Figure 6.20** shows the percent of airports by classification that meet the sizing recommendations calculated through the ACRP Report 113 methodology.

Figure 6.20. Percent of Airports by Classification with GA Terminals Meeting Size Guidelines



Sources: ACRP Report 113; 2018 Inventory & Data Form; Kimley-Horn, 2019

According to ACRP Report 113, airports should ensure that in planning a GA terminal building that it first meets the needs of the airport and fits within the project budget. This may serve as an explanation to the high percentage of GA-Rural airports not having an existing GA terminal building.

The infrequency and minimal number of daily and annual operations may not justify the provision and maintenance of a terminal building at these smaller airports. Similar to the limitations associated with Commercial Service terminal buildings, this high-level analysis does not take into account specific challenges unique to each airport's demands. For this reason, facility and service objectives for terminal buildings were established and chosen as the preferred metric for evaluating terminal facilities at the statewide level.

Airfield Capacities

An examination of airfield capacities was conducted as a supplemental analysis of the Access and Mobility PM, "Percent of Airports with Adequate Terminal Capacity". Determining airfield capacity allows each airport to understand how its physical design can sufficiently serve current and projected aviation activity. The main objective of this analysis is to determine the annual service volume (ASV) for each CASP airport. ASVs represent a high-level measure of how many operations an airport can support in a single year. The FAA recommends that airports begin planning additional airfield facilities once annual total operations exceed 60 percent of an airport's calculated ASV. Once the ratio of annual total operations exceeds 80 percent, FAA recommends that measures to address capacity should be in place.

Methodology

ACRP Report 79: *Evaluating Airfield Capacity* outlines different techniques to calculate an airport's ASV dependent on the available informational inputs, resources, and appropriate program. In comparison, the FAA's AC 150/5060-5, Airport Capacity and Delay (issued in 1983) provides a standardized ASV output dependent on runway configuration and the airport's fleet mix index. For the purpose of the CASP, the use of the ACRP Prototype Airfield Capacity Spreadsheet Model developed as part of Report 79 was deemed as the most appropriate methodology to define the ASV for airports in Colorado's aviation system.

The data considerations, methodologies, and inputs utilized to calculate each airport's ASV are described in this section.

Existing Airfield Capacity Data

The initial phase of determining airfield capacity was to research and extract any existing airfield capacity data from each airport's master plan, where available. Once this data was collected, three factors were used to gauge which airports with existing airfield capacity data would need to have their capacities recalculated:

- Airport has a full parallel runway
- Airport has a precision approach
- Airport has existing ASV data from the master plan

For airports who met all three of the following criteria, the airport master plan ASV was used for the 2020 CASP. The 13 airports meeting the above criteria and for which master plan data were used are shown in **Table 6.5**.

Table 6.5. Airports Whose Master Plan Airfield Capacities Were Utilized

Airport Information		
Associated City	Airport Name	FAA ID
Colorado Springs	Colorado Springs Municipal	COS
Colorado Springs	Meadow Lake	FLY
Denver	Centennial	APA
Denver	Denver International	DEN
Denver	Rocky Mountain Metropolitan	BJC
Denver	Colorado Air and Space Port	CFO
Durango	Durango-La Plata County	DRO
Granby	Granby-Grand County	GNB
Grand Junction	Grand Junction Regional	GJT
Greeley	Greeley-Weld County	GXY
Longmont	Vance Brand	LMO
Montrose	Montrose Regional	MTJ
Rifle	Rifle Garfield County	RIL

Source: Airport master plans

Airfield capacity calculations were calculated for the remaining 53 airports.

Prototype Airfield Capacity Spreadsheet Model

Per ACRP Report 79: *Evaluating Airfield Capacity*, the Prototype Airfield Capacity Spreadsheet Model provides the ability to calculate the ASV and hourly operations that an airport can handle in Visual Meteorological Conditions (VMC) and Instrument Meteorological Conditions (IMC) using different inputs unique to the individual airport. The data was analyzed to determine the number of operations that the airport can facilitate based on its operational fleet mix, the amount of touch and go operations that occur, the percent of the year the airport is affected by VMC, etc.

Inputs & Assumptions

The minimal inputs needed to estimate individual airport ASVs are listed in **Table 6.6**. These data points were collected for CASP airports included in the airfield capacity analysis.

Table 6.6. Spreadsheet Modeling Inputs

Input	Description of Input	Source of Information
Percent of VMC Conditions	The percent of the year that an airport will experience VMC conditions	Airport Master Plans, or ALPs when available
Percent of Touch and Go's	The percent of total operations that are comprised of Touch and Go's	2018 Inventory & Data Form
Operational Fleet Mix Percentages	The airport's current operational fleet mix percentages arranged into seven different categories based on each aircraft's Maximum Gross Takeoff Weight (MTOW)	2018 Inventory & Data Form
Runway Conditions	The number of existing runway exits OR the availability of a full parallel taxiway	2018 Inventory & Data Form
Air Traffic Control Tower	The existence of an air traffic control tower	2018 Inventory & Data Form
Airport Runway Configuration	The layout of the airport's runway(s)	Google Earth

Sources: ACRP Report 79: Prototype Airfield Capacity Spreadsheet Model User's Guide, 2012; Kimley-Horn, 2019

Some assumptions were made to gauge how inputs should be measured for each airport that did not have this information readily available through research or previous analyses. Assumptions were necessary to obtain the minimal data needed to calculate the ASV. Those assumptions included:

- PERCENT OF VMC CONDITIONS – If the airport did not have VMC data available, data for the nearest airport with VMC data was used.
- PERCENT OF TOUCH AND GO'S – If the airport did not have existing touch-and-go data available, then the following inputs were assumed based on information provided in the 2018 Inventory & Data Form:
    - If the airport had flight training and military operations: 15% was applied
    - If the airport had flight training: 10% was applied
    - If the airport had military operations: 5% was applied
    - If the airport did not have flight training or military operations: 0% was applied

Limitations

The analysis includes a substantial number of inputs that can be customized to fit the airport's unique conditions including departure and arrival separation distances, arrival gap spacing buffering, length of common approach, etc. Advanced inputs were not used and inputs outside of the necessary inputs listed in **Table 6.6** were left as the default allocation. The default inputs assume generic factors affect the airport and are not reflective of those specific conditions affecting the airport. The assumptions

made for VMC percentages and touch-and-go percentages may also differ from the actual conditions at the airports and should be taken into consideration. Airports are recommended to complete their own airfield capacity analyses to gain the most accurate representation of ASV or even more detailed hourly capacity analyses.

Findings

ASVs serve as important metrics to gain insights into addressing current or future airport capacity needs. The resulting existing ASV calculations show that Colorado's system-wide airfield capacity is well-maintained and can adequately accommodate current and future operational growth when viewed as a whole system. **Table 6.7** displays the calculated ASVs for all CASP airports except DEN.

Table 6.7. Airfield Capacity

Airport Name	Airport Name	FAA ID	Annual Service Volume (ASV)	CASP 2018 Baseline Operations	Percent of ASV
Akron	Colorado Plains Regional	AKO	130,100	20,500	15.8%
Alamosa	San Luis Valley Regional	ALS	156,400	5,718	3.7%
Aspen	Aspen-Pitkin County	ASE	151,000	42,222	28.0%
Blanca	Blanca	05V	74,400	1,000	1.3%
Boulder	Boulder Municipal	BDU	152,600	51,358	33.7%
Brush	Brush Municipal	7V5	74,400	1,461	2.0%
Buena Vista	Central Colorado Regional	AEJ	145,100	10,000	6.9%
Burlington	Kit Carson County	ITR	137,200	8,000	5.8%
Canon City	Fremont County	1V6	138,300	13,778	10.0%
Center	Leach	1V8	74,400	833	1.1%
Colorado Springs	Colorado Springs Municipal	COS	340,000	137,273	40.4%
Colorado Springs	Meadow Lake	FLY	230,000	65,814	28.6%
Cortez	Cortez Municipal	CEZ	154,000	9,834	6.4%
Craig	Craig-Moffat	CAG	137,700	12,000	8.7%
Creede	Mineral County Memorial	C24	77,100	1,439	1.9%
Del Norte	Astronaut Kent Rominger	RCV	122,200	5,745	4.5%
Delta	Blake Field	AJZ	139,600	2,910	2.1%
Denver	Centennial	APA	525,000	340,721	64.9%
Denver	Denver International	DEN	730,500	594,522	81.4%
Denver	Rocky Mountain Metropolitan	BJC	285,000	171,262	60.1%
Denver	Colorado Air and Space Port	CFO	270,000	79,704	29.5%
Durango	Durango-La Plata County	DRO	195,000	30,190	15.5%
Eads	Eads Municipal	9V7	74,400	728	1.0%

Airport Name	Airport Name	FAA ID	Annual Service Volume (ASV)	CASP 2018 Baseline Operations	Percent of ASV
Eagle	Eagle County Regional	EGE	166,700	40,419	24.2%
Erie	Erie Municipal	EIK	141,500	52,000	36.7%
Fort Collins/Loveland	Northern Colorado Regional	FNL	170,700	96,008	56.2%
Fort Morgan	Fort Morgan Municipal	FMM	118,700	10,000	8.4%
Glenwood Springs	Glenwood Springs Municipal	GWS	87,900	22,020	25.1%
Granby	Granby-Grand County	GNB	230,000	2,600	1.1%
Grand Junction	Grand Junction Regional	GJT	200,000	46,317	23.2%
Greeley	Greeley-Weld County	GXY	260,000	123,721	47.6%
Gunnison	Gunnison-Crested Butte Regional	GUC	122,000	6,929	5.7%
Haxtun	Haxtun Municipal	17V	117,300	90	0.1%
Hayden	Yampa Valley	HDN	140,300	14,323	10.2%
Holly	Holly	K08	87,900	1,085	1.2%
Holyoke	Holyoke	HEQ	139,600	8,500	6.1%
Julesburg	Julesburg Municipal	7V8	89,000	312	0.4%
Kremmling	Mc Elroy Airfield	20V	142,900	1,831	1.3%
La Junta	La Junta Municipal	LHX	97,900	9,258	9.5%
La Veta	Cuchara Valley	07V	102,500	50	0.0%
Lamar	Lamar Municipal	LAA	116,500	3,399	2.9%
Las Animas	Las Animas-Bent County	7V9	89,000	856	1.0%
Leadville	Lake County	LXV	136,900	5,000	3.7%
Limon	Limon Municipal	LIC	102,500	6,000	5.9%
Longmont	Vance Brand	LMO	230,000	72,939	31.7%
Meeker	Meeker/Coulter Field	EEO	143,000	8,070	5.6%
Monte Vista	Monte Vista Municipal	MVI	111,900	6,000	5.4%

Airport Name	Airport Name	FAA ID	Annual Service Volume (ASV)	CASP 2018 Baseline Operations	Percent of ASV
Montrose	Montrose Regional	MTJ	215,000	30,925	14.4%
Nucla	Hopkins Field	AIB	103,600	4,220	4.1%
Pagosa Springs	Stevens Field	PSO	162,000	17,053	10.5%
Paonia	North Fork Valley	7V2	89,000	2,000	2.2%
Pueblo	Pueblo Memorial	PUB	378,000	196,074	51.9%
Rangely	Rangely	4V0	153,400	47,115	30.7%
Rifle	Rifle Garfield County	RIL	210,000	14,561	6.9%
Saguache	Saguache Municipal	04V	74,400	72	0.0%
Salida	Harriet Alexander Field	ANK	90,900	4,053	4.5%
Springfield	Springfield Municipal	8V7	136,100	4,575	3.4%
Steamboat Springs	Steamboat Springs	SBS	75,900	11,112	14.6%
Sterling	Sterling Municipal	STK	138,100	2,176	1.6%
Telluride	Telluride Regional	TEX	137,700	9,402	6.8%
Trinidad	Perry Stokes	TAD	116,500	5,880	5.0%
Walden	Walden-Jackson County	33V	105,400	1,103	1.0%
Walsenburg	Spanish Peaks Airfield	4V1	100,500	5,000	5.0%
Westcliffe	Silver West	C08	79,000	930	1.2%
Wray	Wray Municipal	2V5	139,600	14,600	10.5%
Yuma	Yuma Municipal	2V6	104,900	5,000	4.8%

Sources: ACRP Report 79; Airport master plans; 2018 Inventory & Data Form; FAA TAF, 2018; Kimley-Horn, 2019

Three airports, Denver International (DEN), Rocky Mountain Metropolitan (BJC) and Centennial (APA), were identified as having their 2018 annual operations at or exceeding 60 percent of their ASV (as highlighted in red)[6]. Pueblo (PUB) and Northern Colorado Regional (FNL) were within 10 percent of reaching the ASV planning threshold and are highlighted in orange.

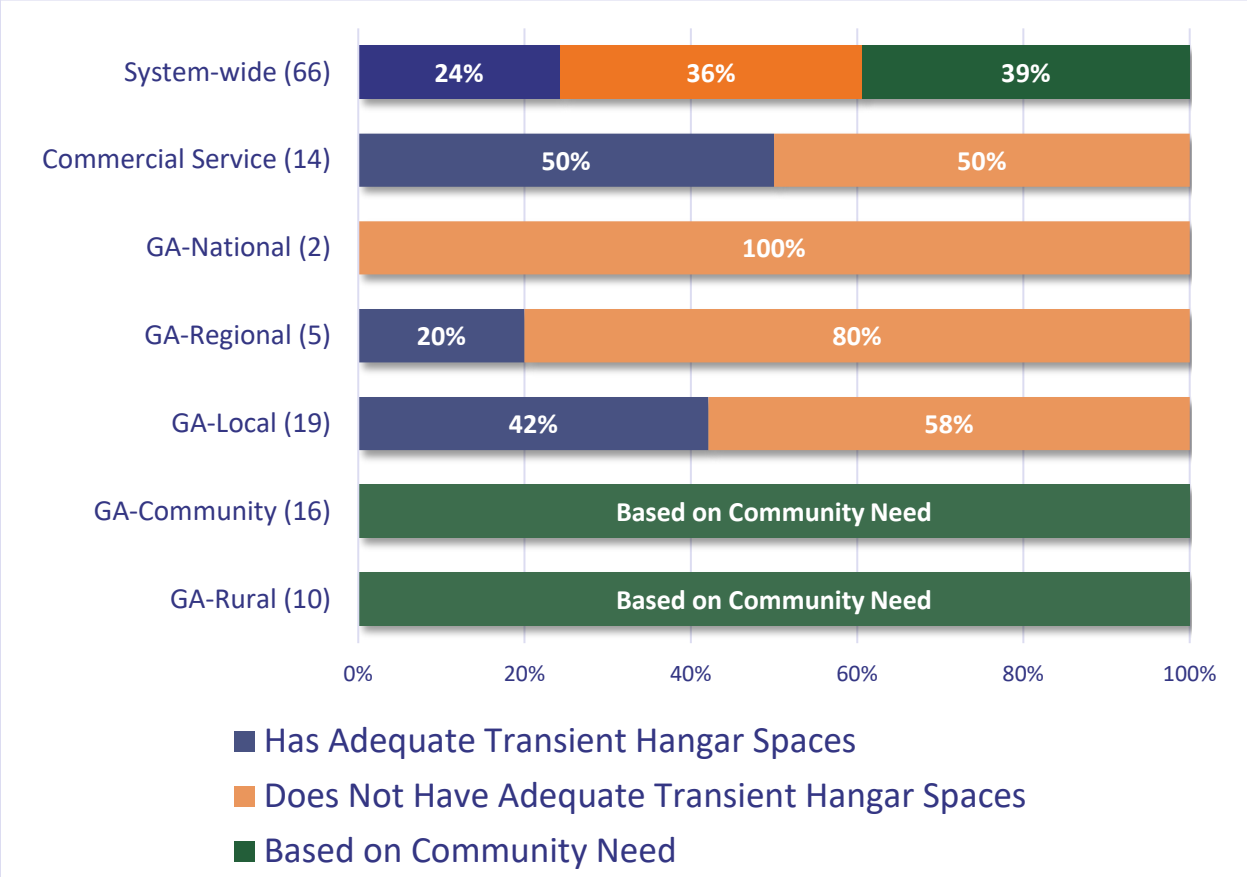
6.3.1.4. Percent of Airports with Adequate Transient Hangar Spaces

Transient hangar space offers non-local pilots and aircraft owners the ability to safely secure their aircraft overnight, especially during inclement weather or even periods of high heat. Offering enough transient hangar space on airports to accommodate this type of aviation activity establishes increased mobility and access for pilots and aircraft owners across Colorado. During the winter months, availability of adequate hangar space also provides direct cost benefits and indirect environmental benefits as it significantly reduces the need for aircraft de-icing. For this PM, adequate transient hangar space was evaluated consistent with CASP facility and service objectives. Commercial Service, GA-National, and GA-Regional airports are meeting their objective if they have enough hangars to accommodate at least 50 percent of their weekly average overnight transient storage. GA-Local airports providing 25 percent of weekly average overnight transient storage meet these objectives. GA-Community and GA-Rural airport transient hangar space objectives are based on community needs.

Twenty-four percent of system-wide airports provide adequate hangar spaces for transient aircraft based on the objectives identified for the various classifications. Fifty percent of Commercial Service airports have adequate transient hangar spaces. Both GA-National airports do not provide adequate transient space equating to zero percent meeting the objective. Twenty percent of GA-Regional airports have adequate space and 42 percent of GA-Local airports are meeting their objective. **Figure 6.21** summarizes the percentage of airports by classification that meet their designated objectives for adequate transient hangar spaces based on airport manager responses.

[6] DEN was revisiting ASV with airfield modeling simulations related to the 7th and 8th runways at the time the 2020 CASP was developed.

Figure 6.21. Percent of Airports by Classification with Adequate Transient Hangar Spaces



Sources: 2018 Inventory & Data Form; Kimley-Horn, 2019

6.3.2. System Indicators

This section discusses the results of the SIs associated with the access and mobility goal category. SIs for this category include the following:

1. Percent of airports that provide ground transportation (courtesy car or other)
2. Percent of population within a 30-minute drive time of a system airport
3. Percent of airports providing access to remote and rural communities

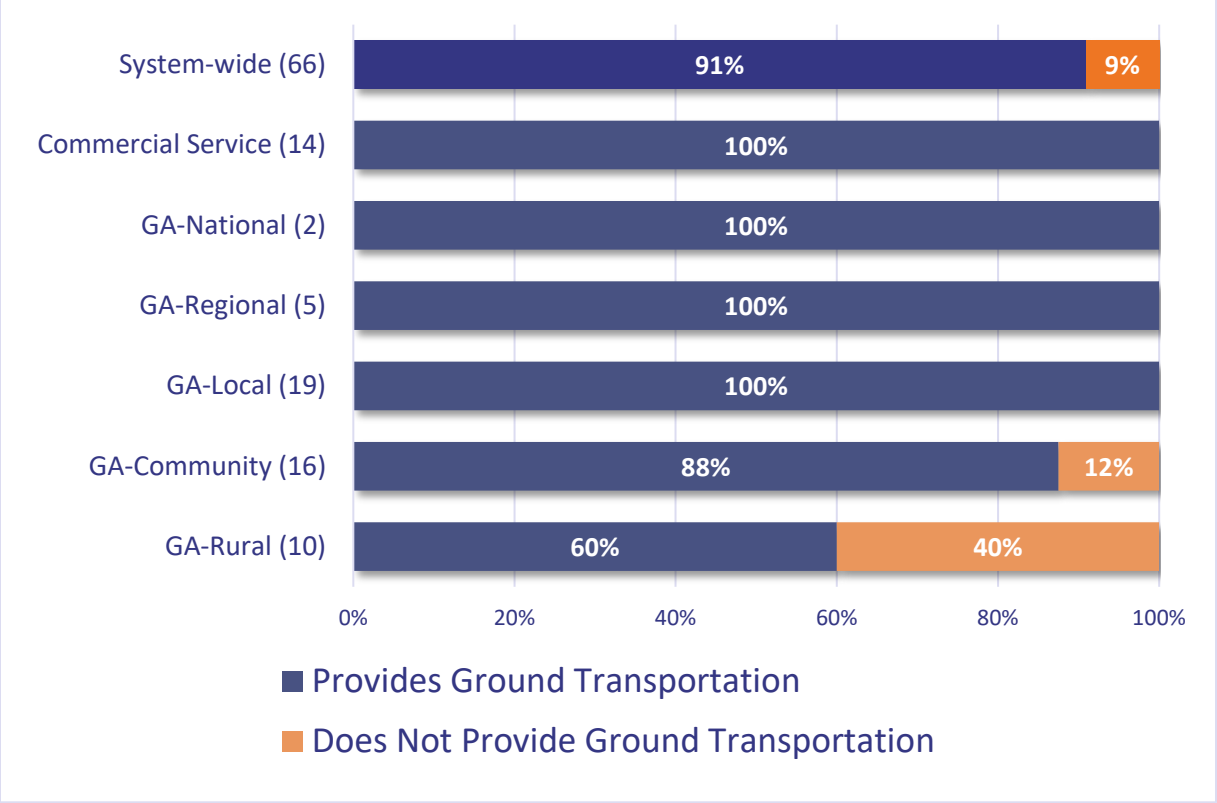
6.3.2.1. Percent of Airports that Provide Ground Transportation (Courtesy Car or Other)

The availability of ground transportation at airports allows visitors to leave the airport to conduct their business and/or leisure actives. These services integrate airports into the multi-modal transportation system, increasing the connectivity between users and their final destinations. Ground transportation can take the form of courtesy cars, rental cars, taxis, commuter rail, Uber/Lyft, or shuttle.

Ninety-one percent of all airports system-wide reported providing some form of ground transportation to visitors at their airports. All airport classifications except for GA-Community and GA-Rural airports provide at least one ground transportation service. More detail on ground transportation at each

system airport can be found in **Chapter 3. Supplemental System Context**. **Figure 6.22** presents the percent of airports by classification that provide some form of ground transportation at their airport.

Figure 6.22. Percent of Airports by Classification that Provide Ground Transportation



Sources: 2018 Inventory & Data Form; 2018 FAA Airport/Facility Directory (AFD)

6.3.2.2. Percent of Population Within a 30-Minute Drive Time of a System Airport

Each airport offers a unique array of facilities and services contributing to the overall strength and accessibility of the system. The airports in the six airport classifications serve different facets of the aviation industry while simultaneously acting as gateways to all parts of the state. Their individual and cumulative functions impact how well the system can serve community, regional, and state needs. This SI assesses the population's access to Colorado airports system-wide and by classification.

Figure 6.23 through **Figure 6.28** portray the percentage of Colorado's population and land area that is covered within a 30-minute drive of each airport by classification. The percentage of population and land area within these drive time buffers are only indicative of the individual classification's reach and not the cumulative area of coverage between multiple classifications. Populations and amount of land where the drive time coverage areas overlapped between airports were only counted once. In instances when an airport's drive time extended into a bordering state, only Colorado population was counted.

Figure 6.23. 30-Minute Drive Times of Commercial Service Airports

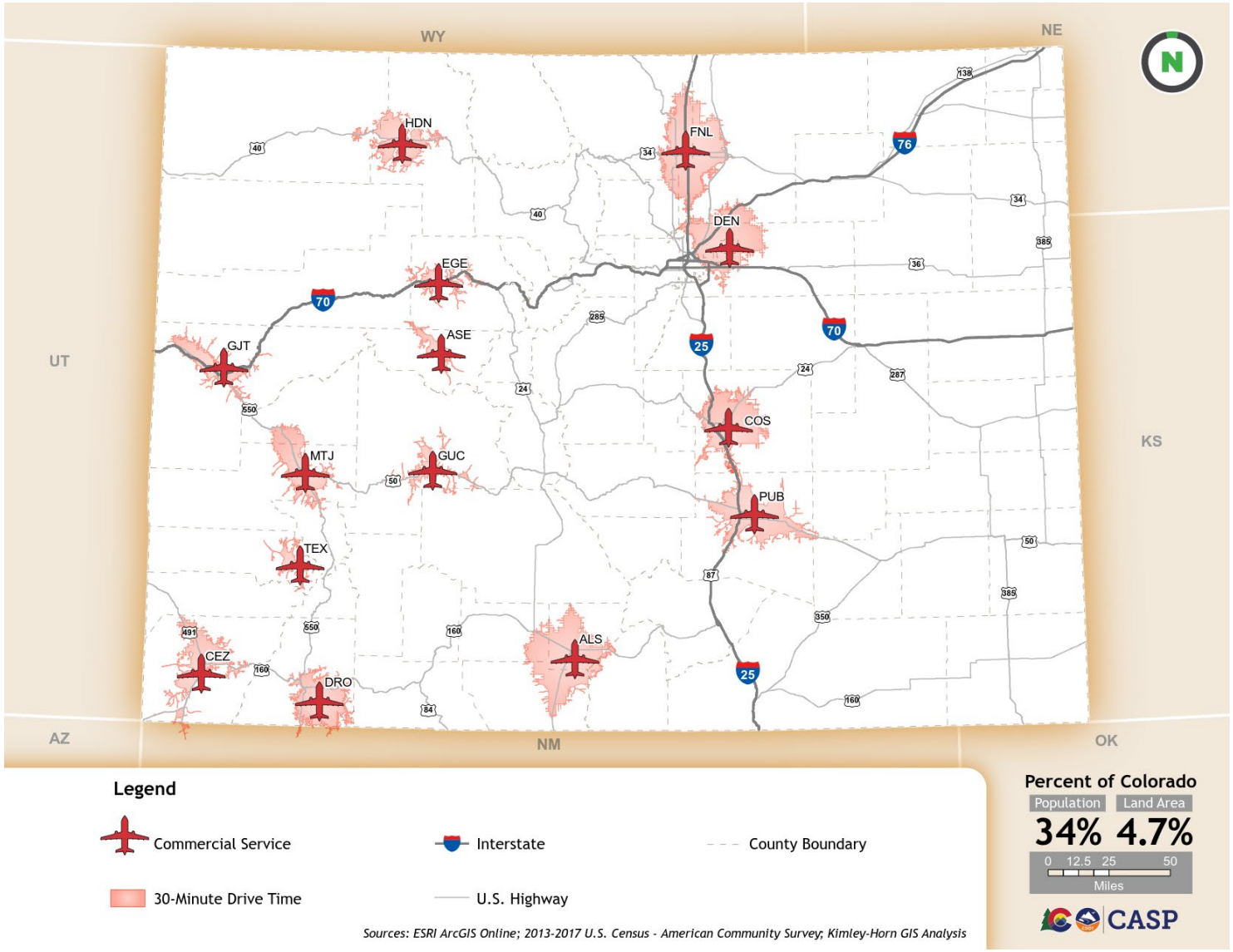


Figure 6.24. 30-Minute Drive Time of GA-National Airports

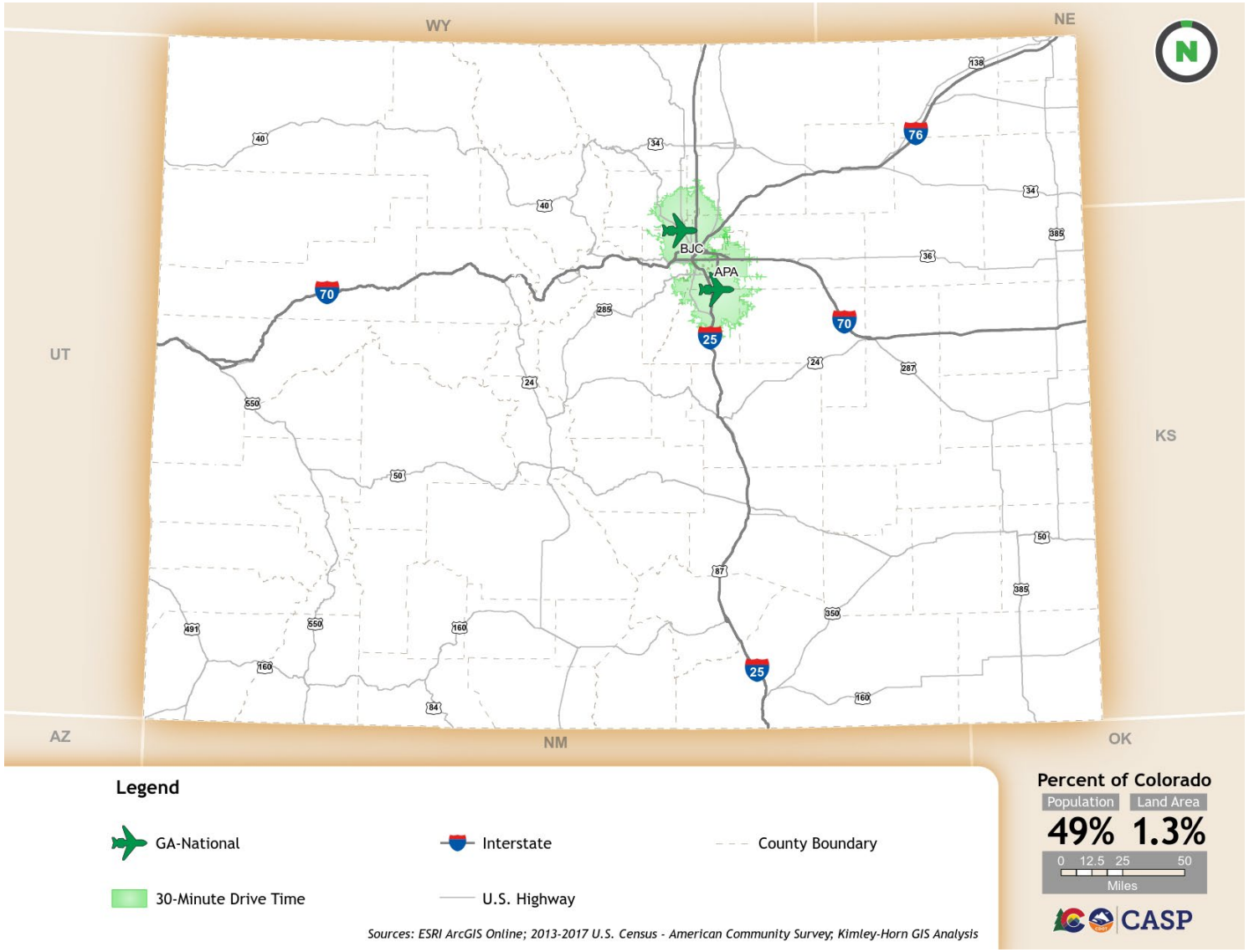


Figure 6.25. 30-Minute Drive Time of GA-Regional Airports

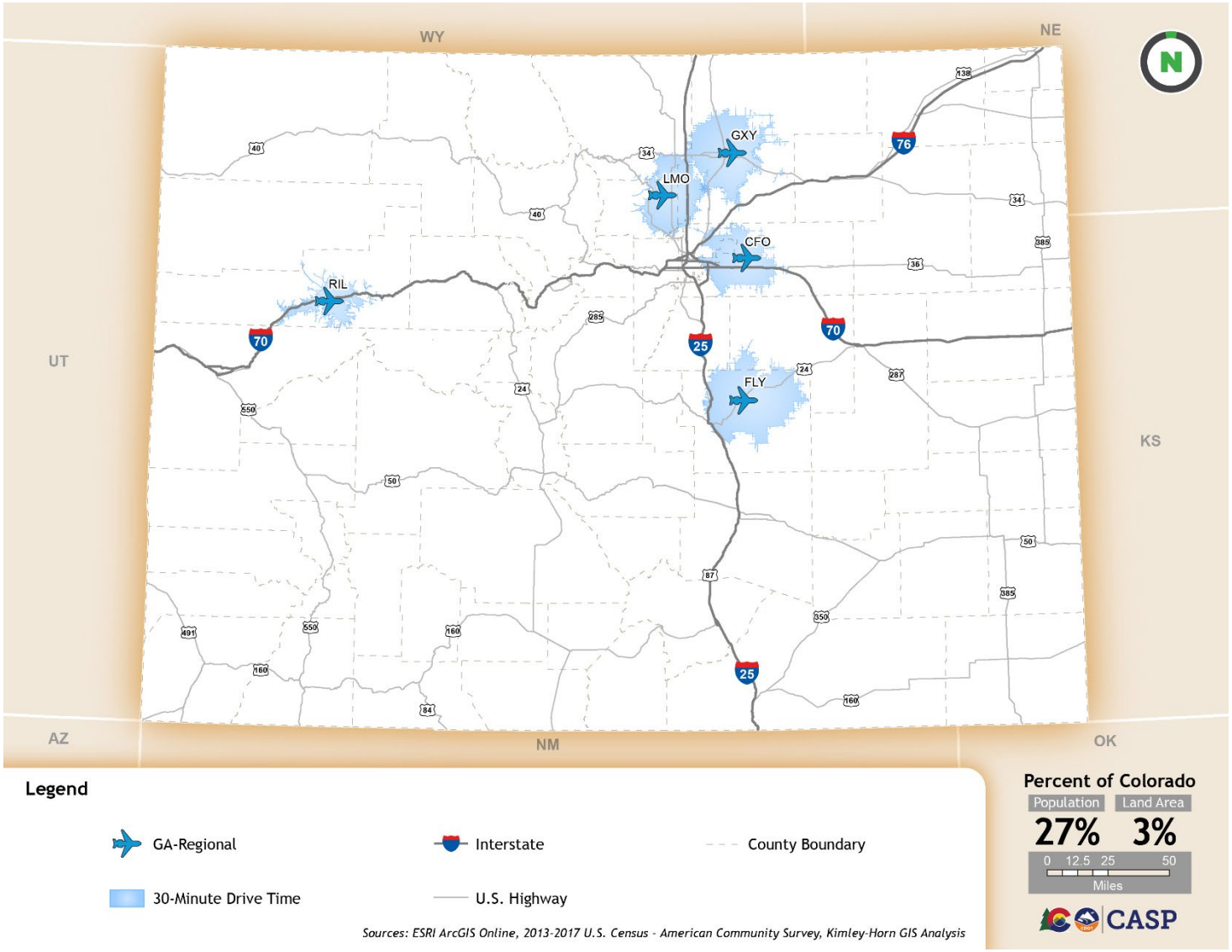


Figure 6.26. 30-Minute Drive Time of GA-Local Airports

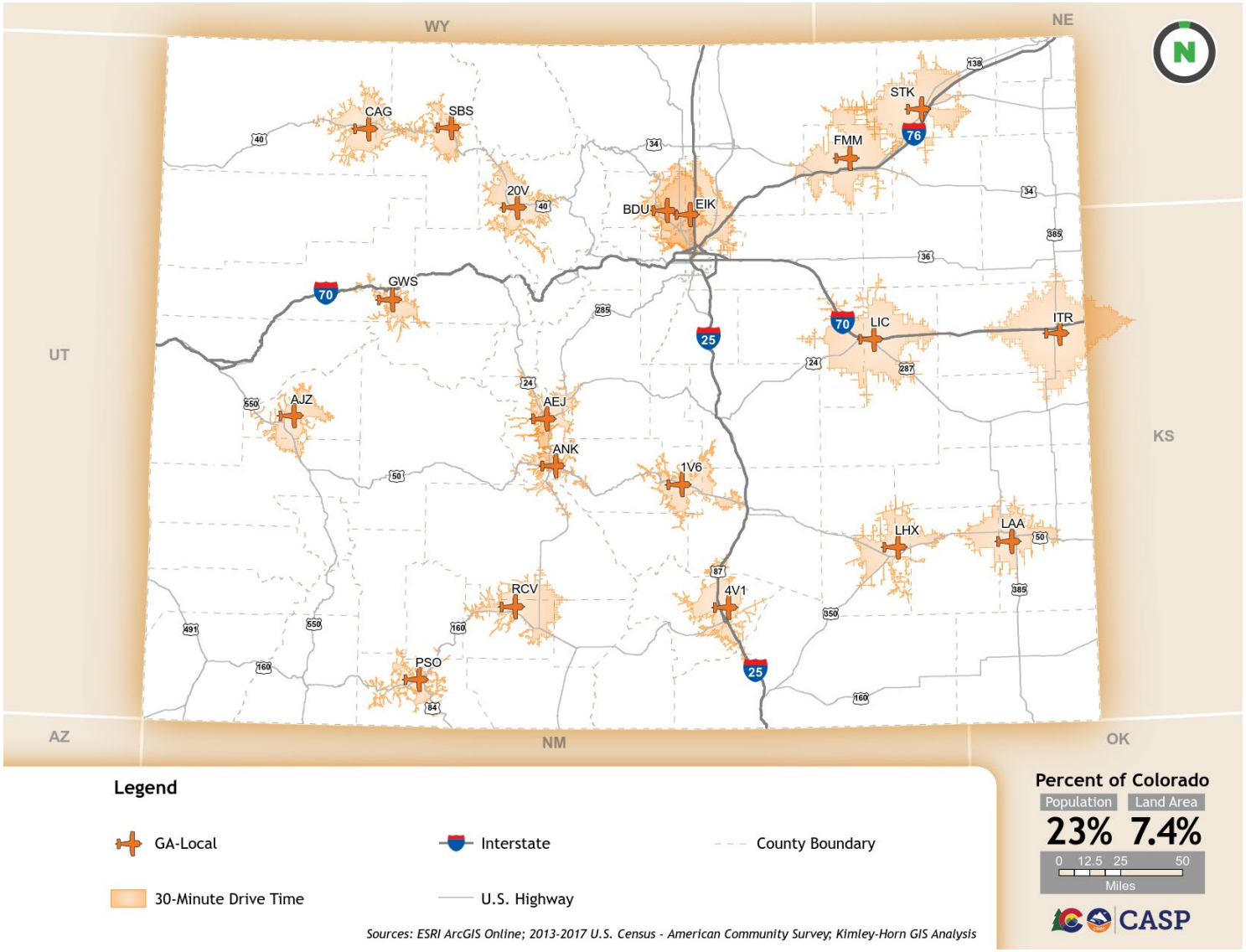


Figure 6.27. 30-Minute Drive Time of GA-Community Airports

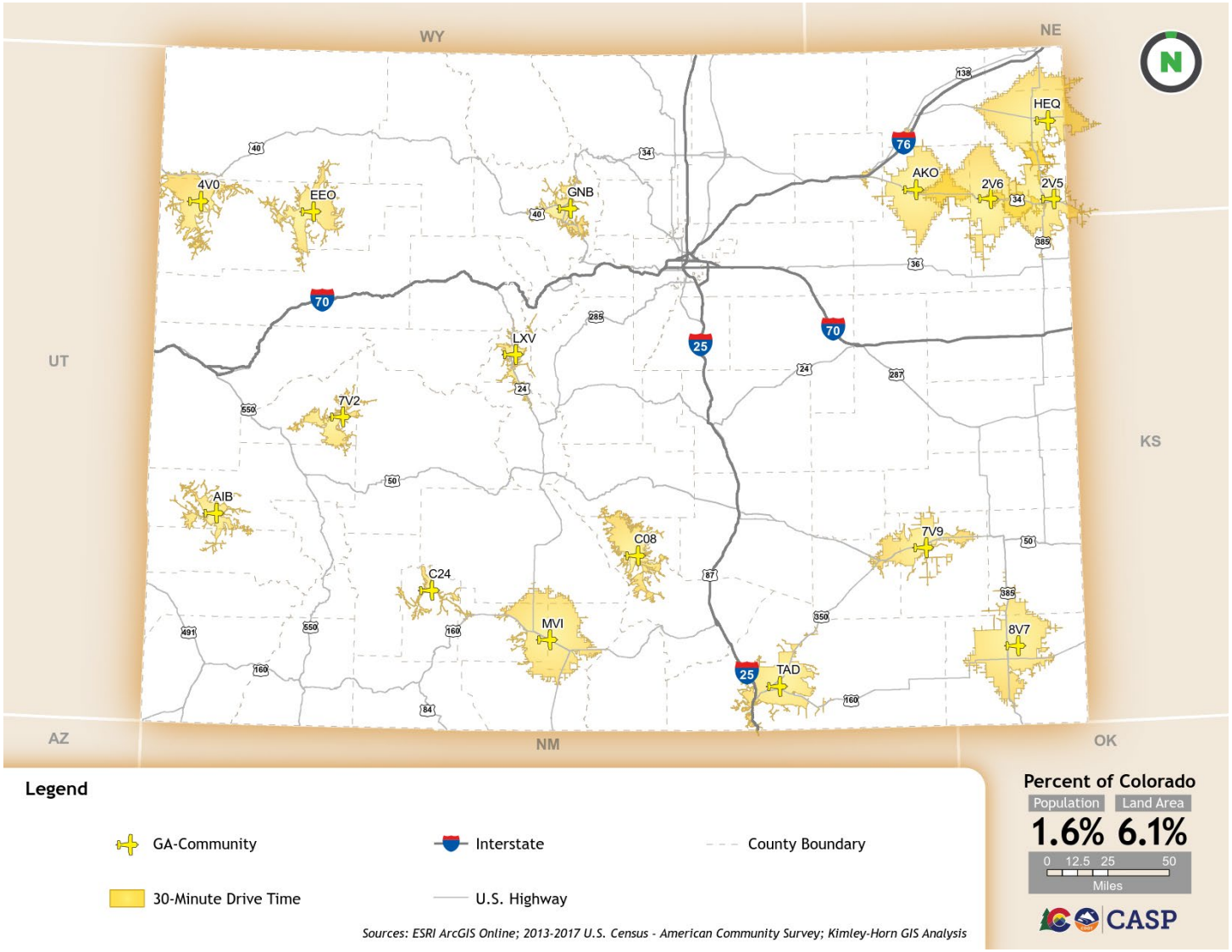
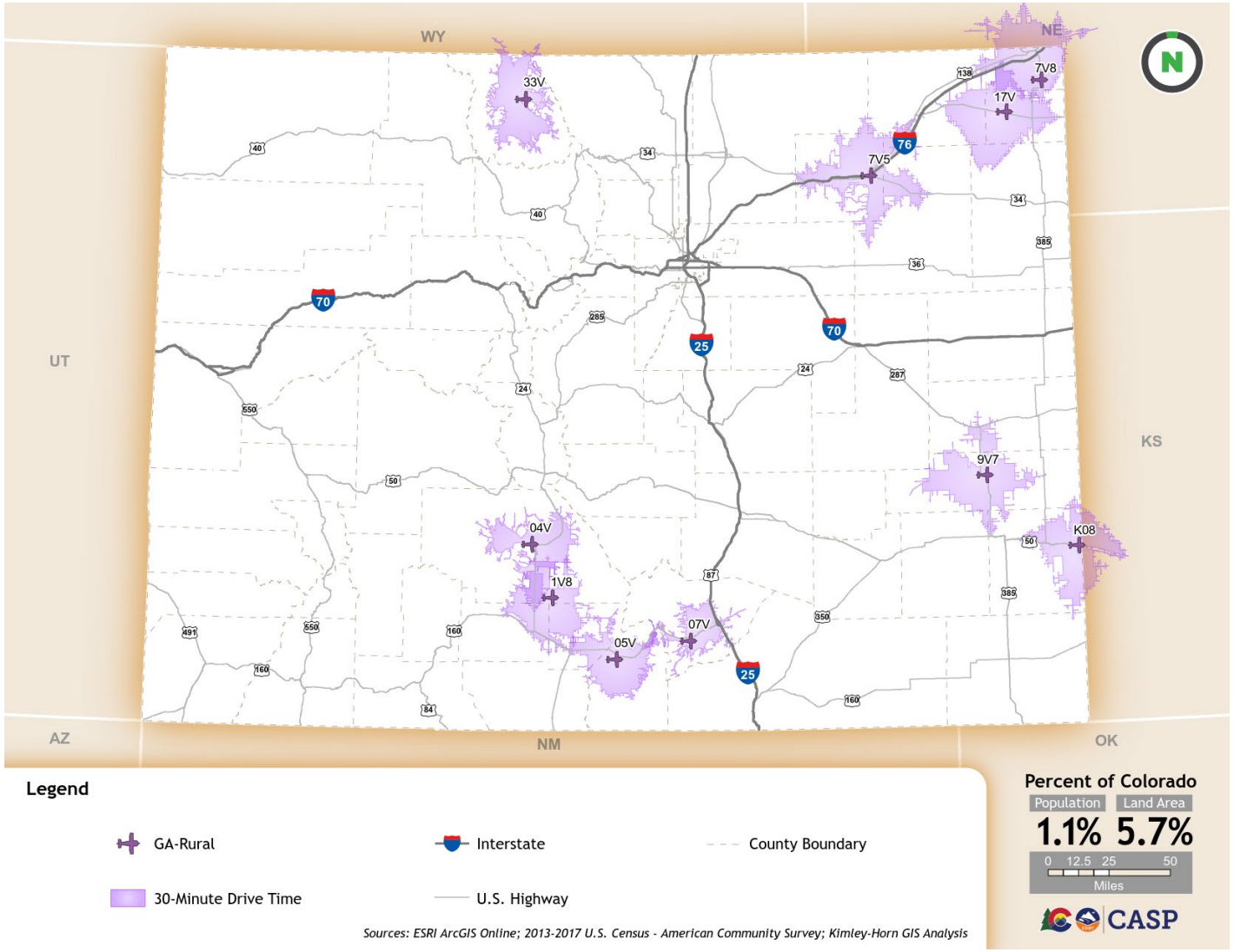


Figure 6.28. 30-Minute Drive Time of GA-Rural Airports



The percent of population and land area encompassed within the 30-minute drive time, arranged by classification, is as follows:

- **Commercial Service:** 34 percent of the population and 4.7 percent of land area
- **GA-National:** 49 percent of the population and 1.3 percent of land area
- **GA-Regional:** 27 percent of the population and 3.0 percent of land area
- **GA-Local:** 23 percent of the population and 7.4 percent of land area
- **GA-Community:** 1.6 percent of the population and 6.1 percent of land area
- **GA-Rural:** 1.1 percent of the population and 5.7 percent of land area

Figure 6.29 through **Figure 6.33** demonstrate the progressing coverage of population and land area that the airports encompass in combination with each other within a 30-minute drive time. The "build" maps shown on the following pages begin by merging Commercial Service and GA-National airports and continually add the next airport classification to show the population and land coverage progression. This analysis showcases how each airport classification's contribution to coverage is an integral component to the overall strength of the system.

Figure 6.29. 30-Minute Drive Time of Commercial Service and GA-National Airports

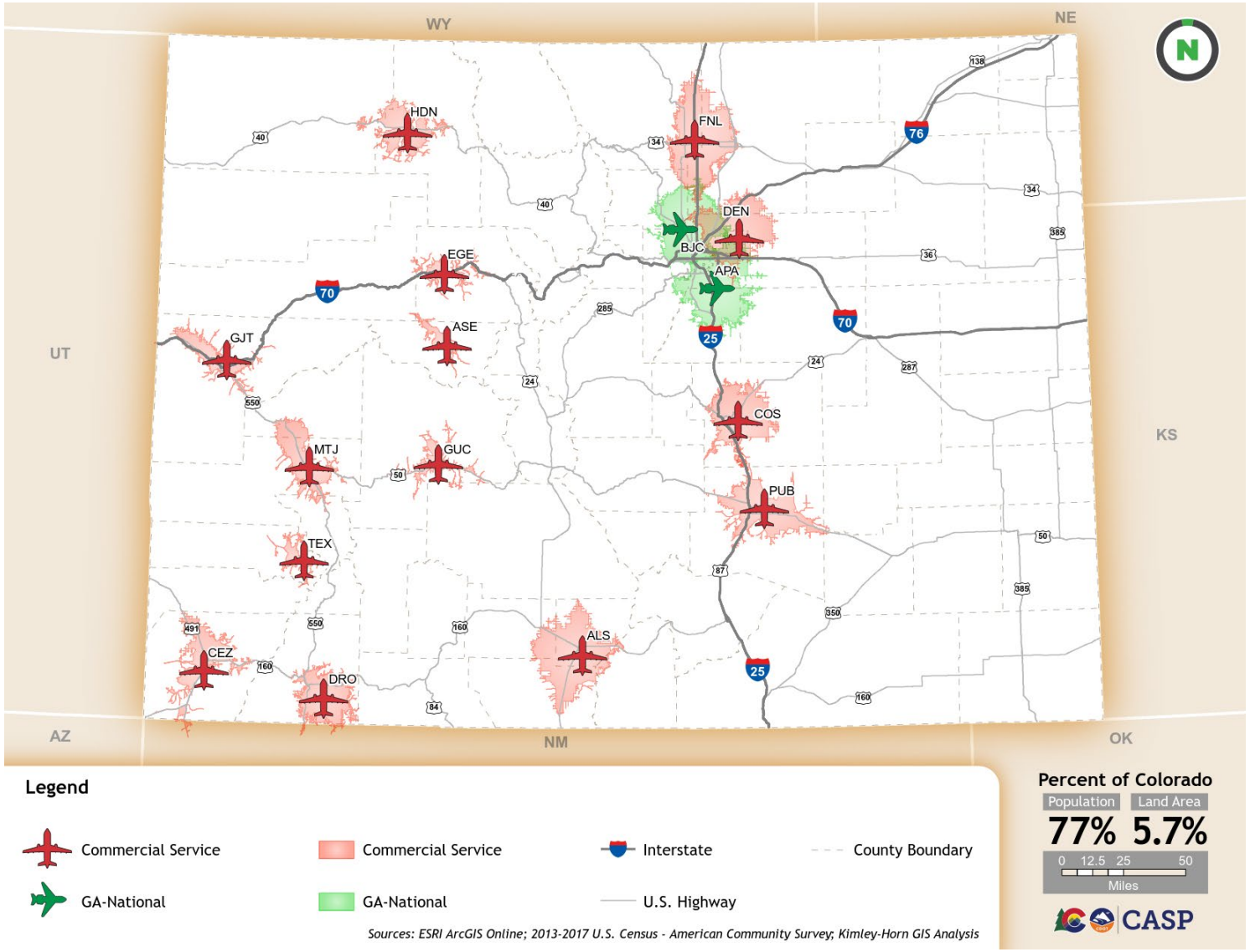


Figure 6.30. 30-Minute Drive Time of Commercial Service, GA-National, and GA-Regional Airports

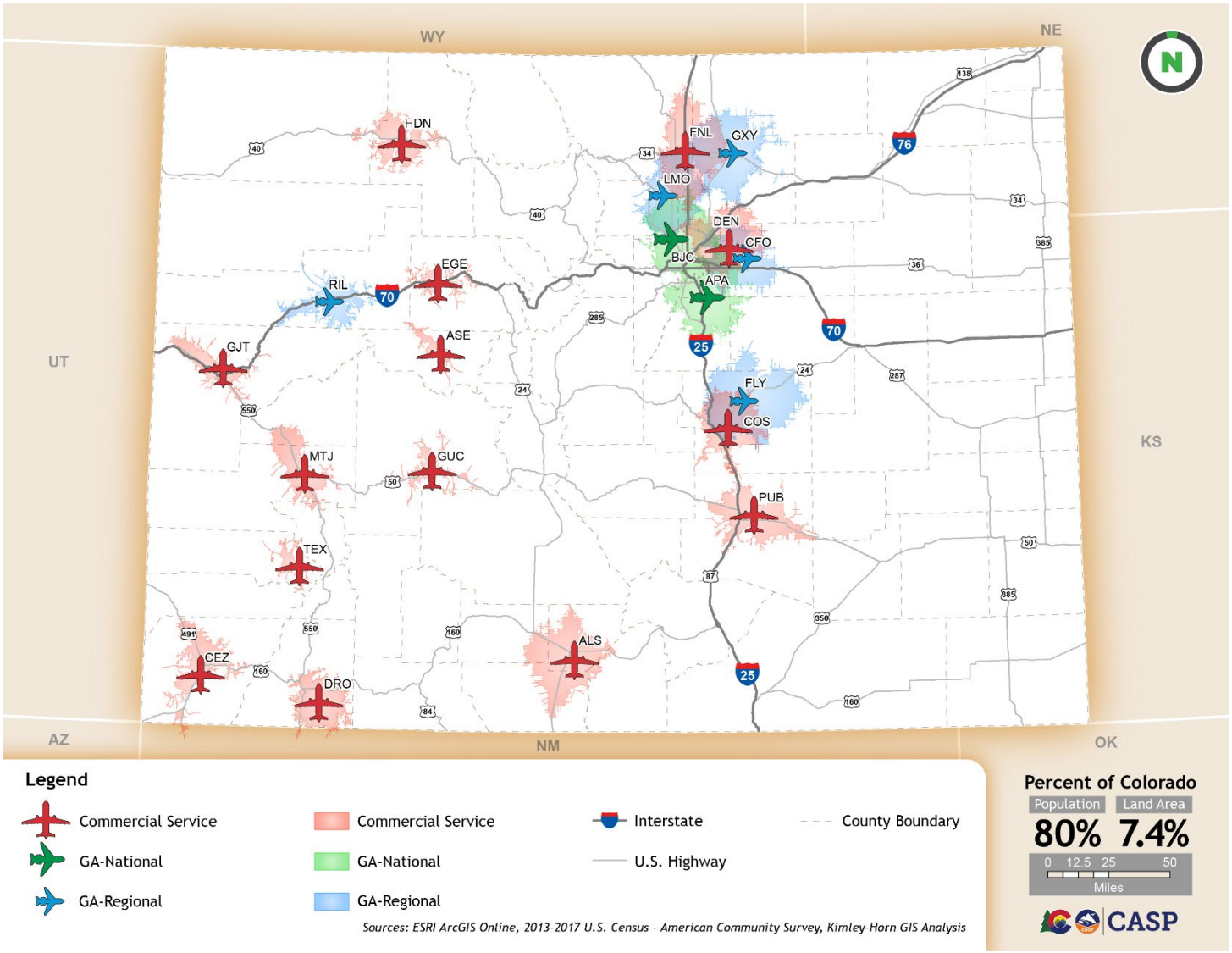


Figure 6.31. 30-Minute Drive Time of Commercial Service, GA-National, GA-Regional, and GA-Local Airports

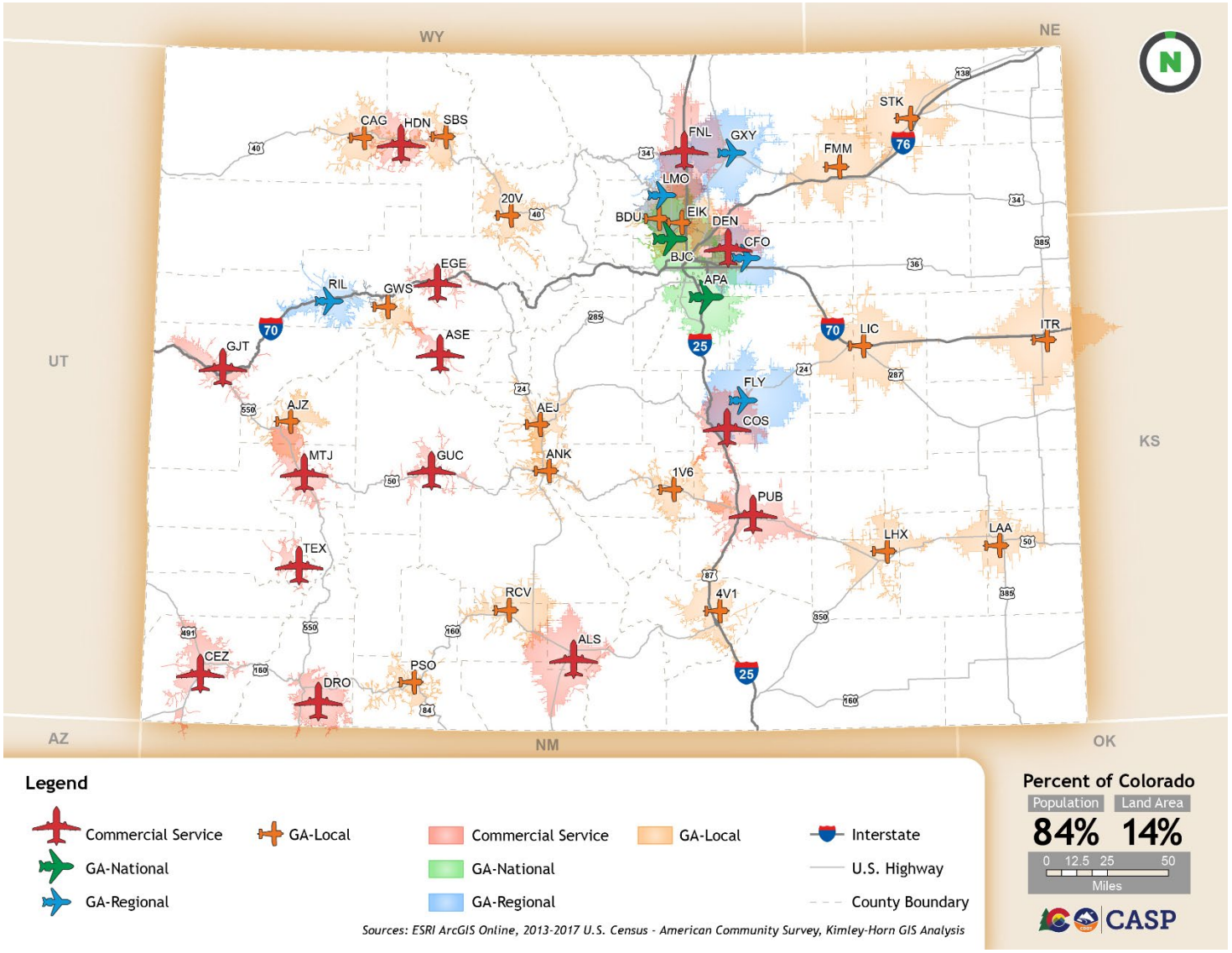


Figure 6.32. 30-Minute Drive Time of Commercial Service, GA-National, GA-Regional, GA-Local, and GA-Community Airports

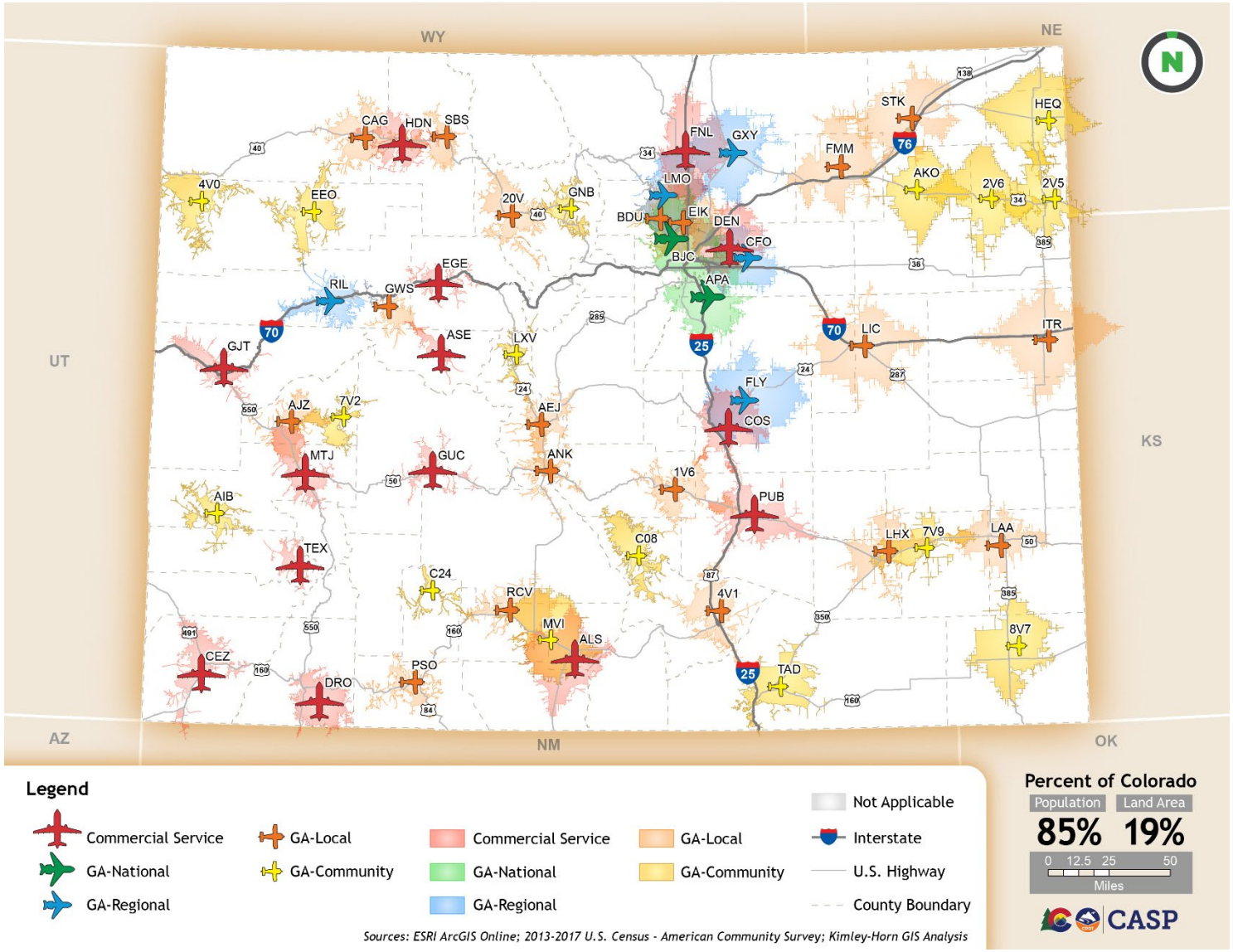
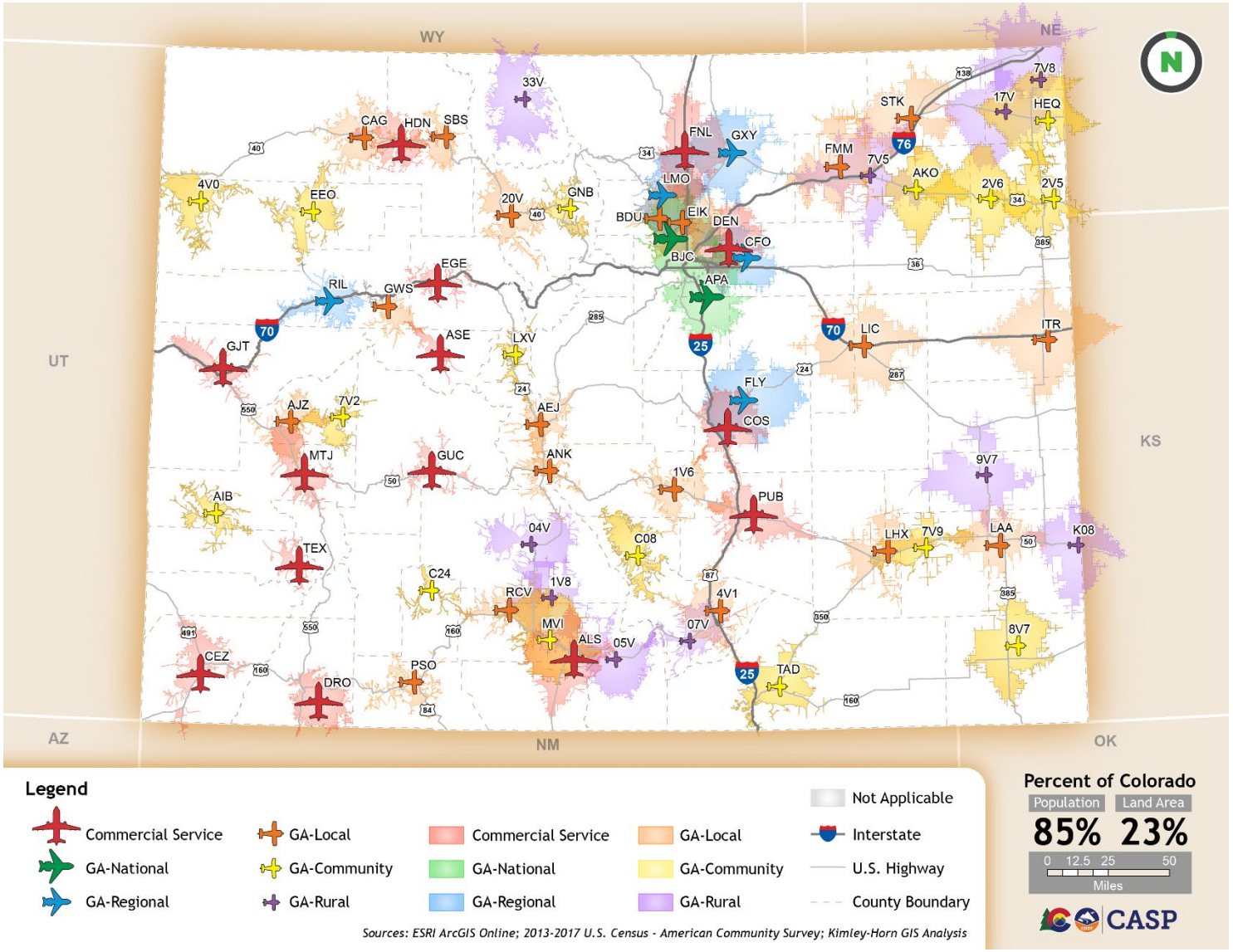


Figure 6.33. 30-Minute Drive Time of All CASP Airports



The resulting coverage from the airport build maps are as follows:

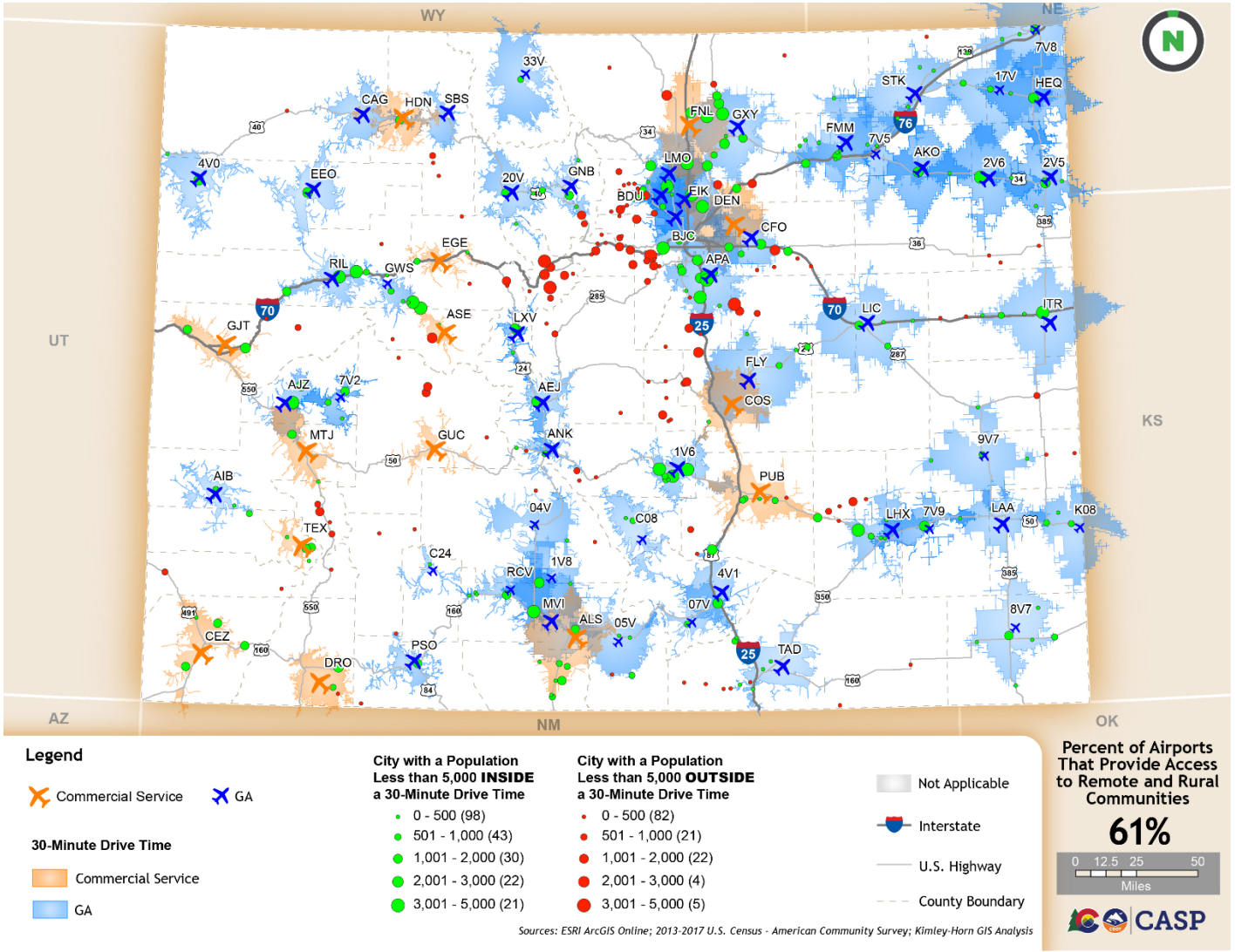
- **Commercial Service and GA-National Airports:** 77 percent of the population and 5.7 percent of land area.
- **Commercial Service, GA-National, and GA-Regional Airports:** 80 percent of the population and 7.4 percent of land area.
- **Commercial Service, GA National, GA-Regional, and GA-Local Airports:** 84 percent of the population and 14 percent of land area.
- **Commercial Service, GA-National, GA-Regional, GA-Local, and GA-Community Airports:** 85 percent of the population and 19 percent of land area.
- **All CASP Airports:** 85 percent of the population and 23 percent of land area.

6.3.2.3. Percent of Airports Providing Access to Remote and Rural Communities

Rural and/or remote communities view airports as a community lifeline. Oftentimes, rural/remote communities rely on airports to facilitate the critical medical transfer of patients, goods and services, cargo, or simply transportation. Commercial service airports are typically located in areas of the state where population density is relatively high. Rural and/or remote communities may have access to commercial service airports, however, the time to get to these facilities can take hours.

For purposes of this analysis, it was determined that a community with a population of less than 5,000 would qualify as a remote and/or rural community. Colorado communities with a population less than 5,000 were mapped using GIS analysis based on 2013-2017 U.S. Census data and compared to the CASP airport locations. Finally, 30-minute drive times were added for all airports which made it possible to identify the communities that were outside of the 30-minute drive time of any CASP airport. The analysis revealed that 61 percent of Colorado's communities that have a population of less than 5,000 are within a 30-minute drive time of a system airport and 39 percent of these communities are beyond a 30-minute drive time to any airport. Results from this analysis are depicted in **Figure 6.34**. Rural/remote communities within the 30-minute drive time are presented in a scaled green dot. Rural/remote communities outside of the 30-minute drive time are presented in scaled red dot.

Figure 6.34. Percent of Airports that Provide Access to Remote and Rural Communities



6.4. Goal: Economic Sustainability

Airports often serve as the catalyst for economic activity such that they directly link people, businesses, goods, and services. To ensure Colorado airports sustain their importance as economic anchors, it is important to leverage and diversify their facilities and services to meet current and anticipated needs of their users. Identifying opportunities and developing relationships to attract new businesses at airports increases their resiliency during economic or market shifts. Working in conjunction with other entities and organizations such as local and regional governments allows the airport to convey long-term goals and protect the ability to respond to future demand through these partnerships. This goal examines the airports' existing relationships, facilities and services, and economic opportunities to assess economic sustainability.

6.4.1. Performance Measures

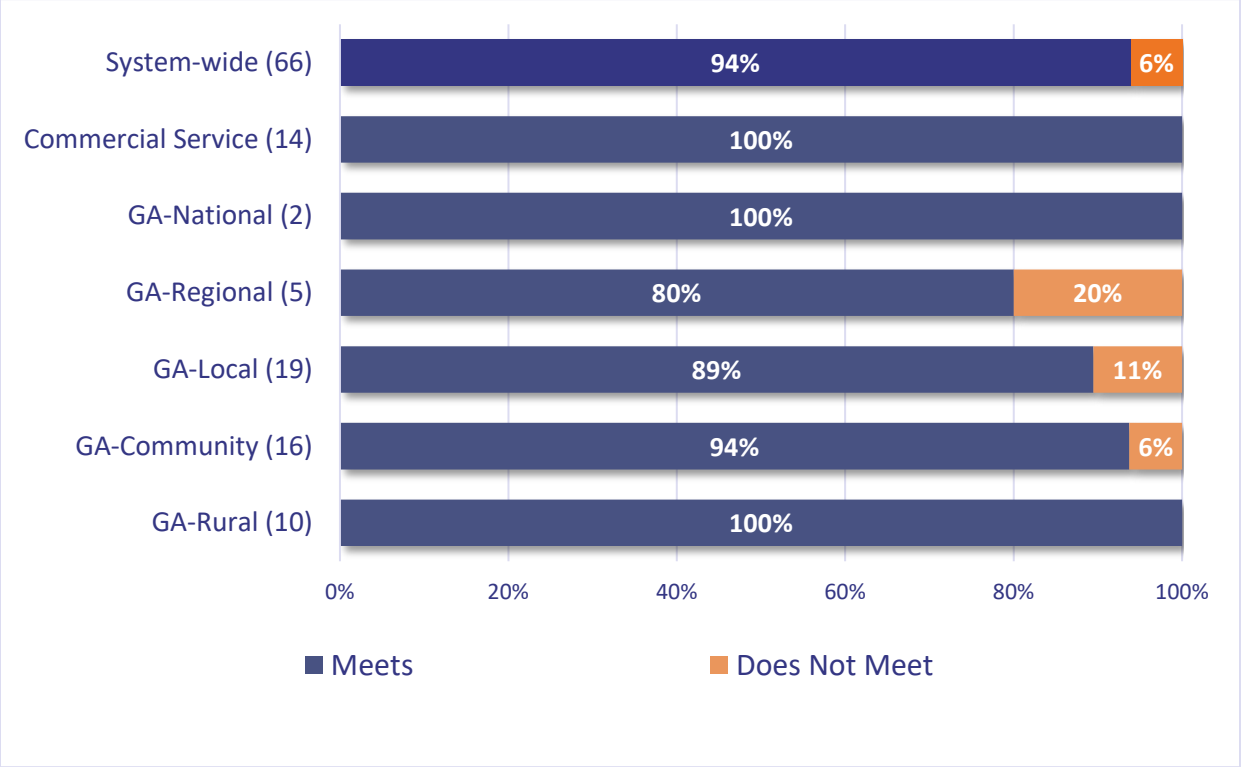
This section discusses the results of the PMs associated with the economic sustainability goal category. PMs for this category include the following:

1. Percent of airports with the necessary fuel type, available 24/7
2. Percent of airports that support the aerospace manufacturing, technology, and/or testing industry
3. Percent of airports with adequate utilities

6.4.1.1. Percent of Airports with Necessary Fuel Type, Available 24/7

Offering fuel facilities that are accessible 24 hours a day, seven days a week (24/7) allows pilots the convenience of fueling their aircraft outside of normal operating hours or when fixed-base operator (FBO) services are unavailable. For this PM, the necessary fuel types for each airport corresponds with the facility and service objectives. Commercial Service, GA-National, and GA-Regional airports are considered to be meeting this PM if they provide full-service aviation gasoline (AvGas/e100 LL) and Jet A fuel. GA-Local and GA-Community airports should provide both AvGas and Jet A fuel facilities 24/7 through either a self-serve facility or call-out service. Fueling facilities at GA-Rural airports should be provided based on community and airport user need/demand. As shown in **Figure 6.35**, the percent of airports that met the minimum service objective determined for their airport classification is relatively high, with 94 percent of airports system-wide meeting the associated objective. GA-Regional airports have the lowest performance with only 80 percent of the airports meeting the objective.

Figure 6.35. Percent of Airports by Classification with Necessary Fuel Type, Available 24/7



Source: 2018 Inventory & Data Form

6.4.1.2. Percent of Airports that Support the Aerospace Manufacturing, Technology, and/or Testing Industry

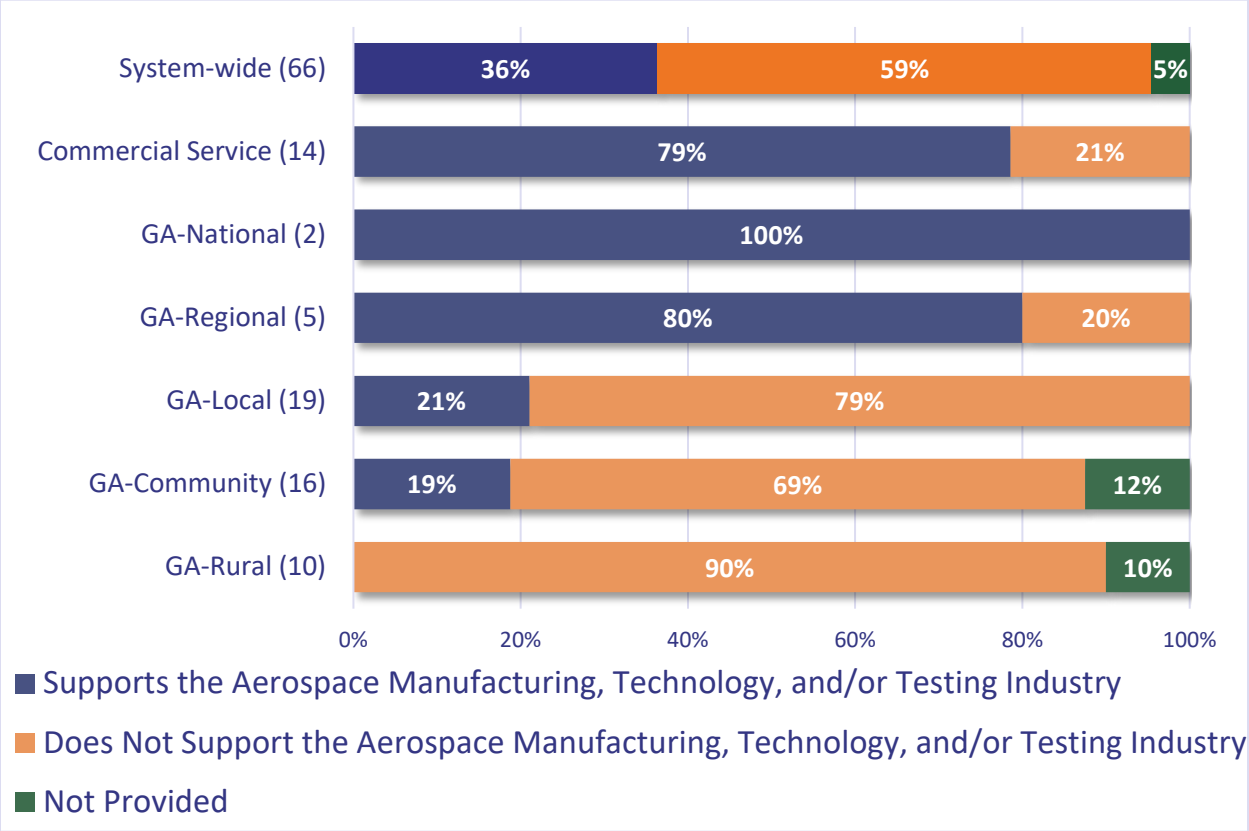
The U.S. Aerospace and & Defense (A&D) industry is one of the largest contributors to the nation's gross domestic product (GDP) and contributed to $374 billion dollars and 2.55 million U.S. jobs alone in 2018[7]. The expanse of A&D services and products covers commercial and GA manufacturing, testing, and technologies amongst countless other outputs. Colorado's high altitude and naturally occurring open space makes it one of the most ideal climates for A&D, especially testing. Colorado boasts the second largest aerospace economy in the nation supported by four military commands, almost 1,000 aerospace companies, approximately 17,000 aerospace employees, and a highly educated population[8]. Aerospace industries gain the ability to conduct high-altitude testing of A&D components and aircraft primarily because of Colorado's unique geography, challenging weather and higher elevations. Aerospace related industries located on-airport is a relationship that benefits both the airport and the client. The presence of an aerospace business indicates the airport is well-positioned economically due to the astounding economic contributions that the aerospace industry provides.

[7] Aerospace Industries Association "2019 Facts & Figures: U.S. Aerospace & Defense", 2019 https://docs.google.com/viewerng/viewer?url=https://www.aia-aerospace.org/wp-content/uploads/2019/09/2019-Facts-and-Figures.pdf&hl=en

[8] Colorado Office of Economic Development & International Trade "Aerospace Industry Profile", 2016 https://choosecolorado.com/wp-content/uploads/2016/06/Aerospace-Industry-Profile_updated.pdf

Airport managers were asked about the presence of any aerospace manufacturer, technology, or and/or testing industry located at their airport. System-wide, about one in every three airports supports at least one of these activities. A large portion of aerospace manufacturing, technology, and/or testing can be found at Commercial Service, GA-National, and GA-Regional airports. **Figure 6.36** displays the system-wide results, and by classification, that have an aerospace-related industry on airport as identified by the airports.

Figure 6.36. Percent of Airports that Support the Aerospace Manufacturing, Technology, and/or Testing Industry



Source: 2018 Inventory & Data Form

Pilatus Aircraft, Ltd is a Swiss aircraft manufacturer known for producing versatile business aircraft that has its U.S. headquarters at BJC. Pilatus opened a 118,000 square-foot state-of-the-art fabrication facility in 2018 and has 120 employees that installs custom executive interiors and exteriors for their PC-12 NGX and PC-24 aircraft. More than 1,800 PC-12 and PC-24 aircraft have been produced, many of which were completed at Rocky Mountain Metropolitan before being exported to customers around the world.

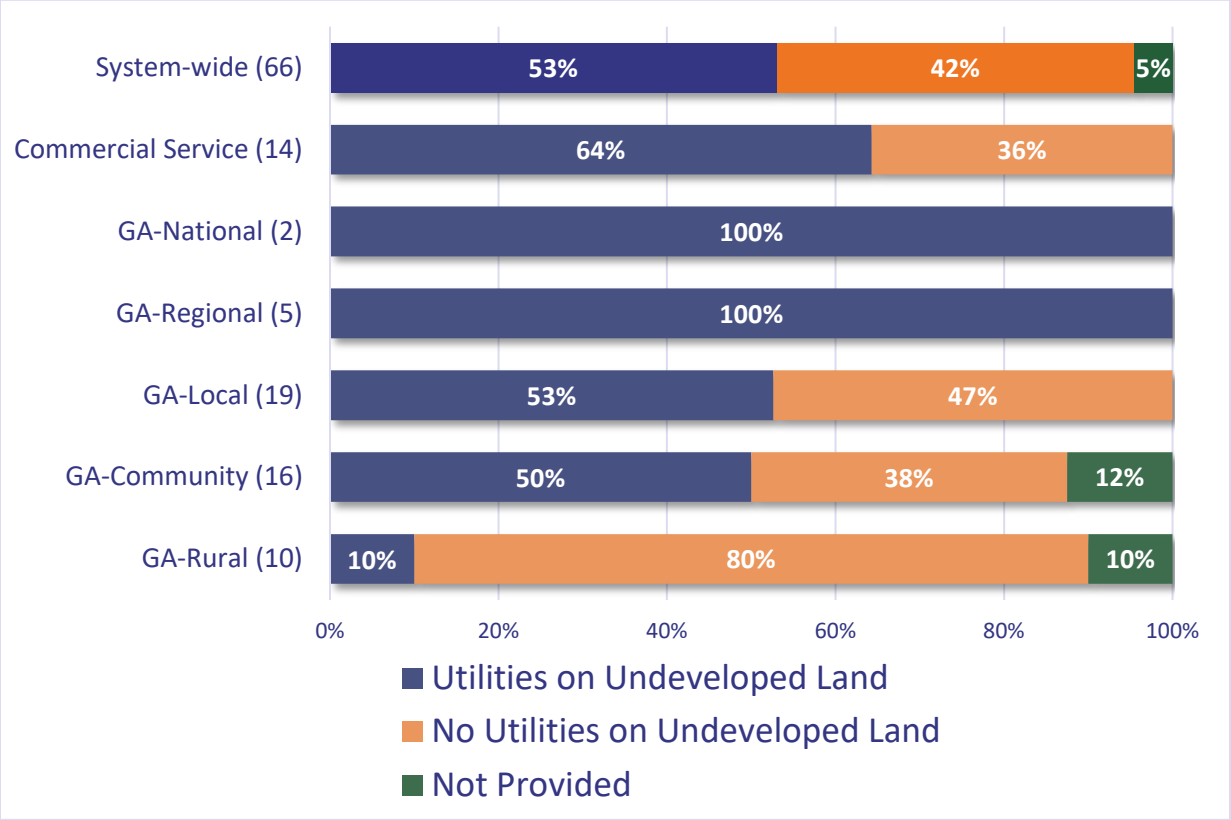
6.4.1.3. Percent of Airports with Adequate Utilities

Utility needs differ from airport to airport. Having adequate utilities to sufficiently supply the needs of the airport now and into the future remains an important consideration when planning for airport development. Outdated or aging infrastructure may result in the recurrence of expensive repairs and replacing them with new infrastructure that accommodates future development may be more cost-effective in the long run. Further, a lack of suitable utility connections may deter potential tenants from developing private facilities on airport property as costs to develop infrastructure may be too high.

Airports were asked during the on-site visits if utilities were available on undeveloped land within the airport property. The presence of existing utilities indicates these areas have been specified for future development and are anticipated to fulfill those needs. Understanding the existence of underground infrastructure impacts development of aboveground facilities.

More than half of system-wide airports (53 percent) report having existing utilities on undeveloped land within the airport property. All GA-National and GA-Regional airports reported utility connections are available on undeveloped land. **Figure 6.37** presents the airports by classification with adequate utilities.

Figure 6.37. Percent of Airports by Classification with Adequate Utilities



Source: 2018 Inventory & Data Form

6.4.2. System Indicators

This section discusses the results of the SIs associated with the economic sustainability goal category. SIs for this category include the following:

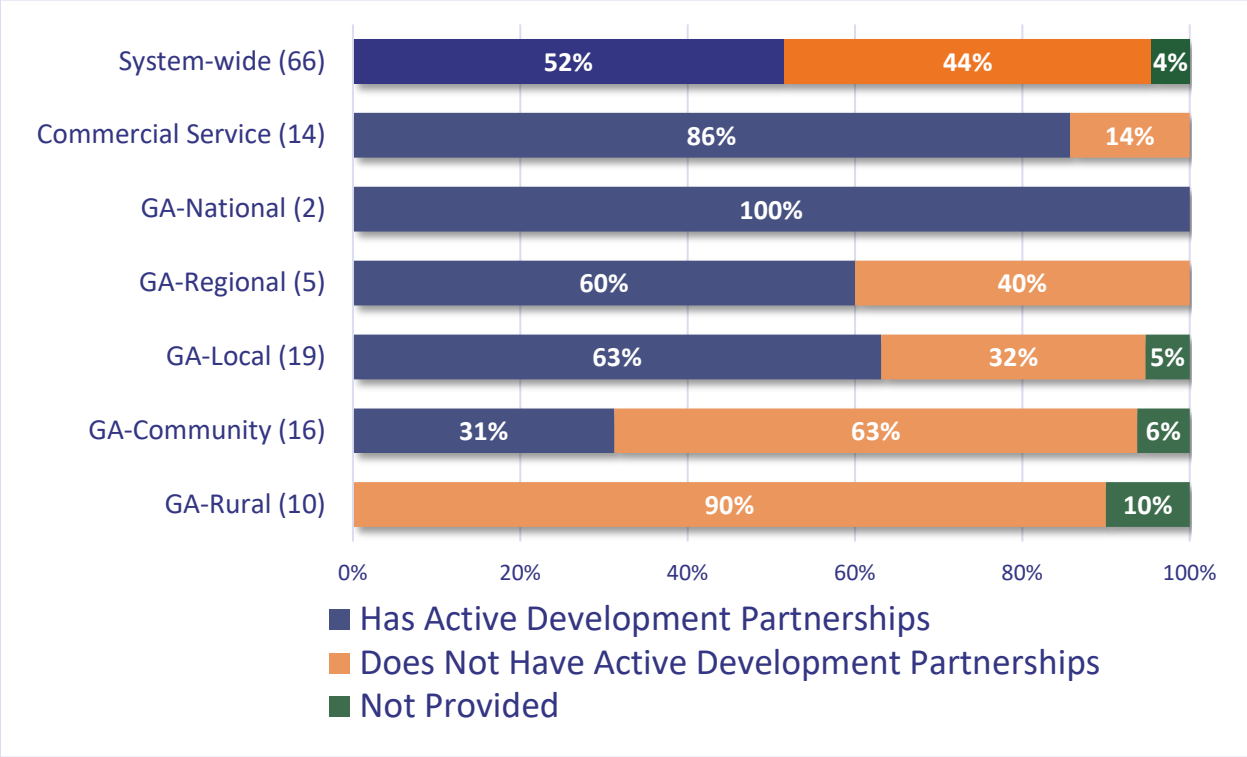
1. Percent of airports with active development partnerships with chambers of commerce, tourism bureaus, organizations, industries, governments, and recreational user groups
2. Percent of airports with business parks or landside real estate development
3. Percent of airports recognized in local and/or regional comprehensive plans
4. Percent of airports that support aerial agricultural application

6.4.2.1. Percent of Airports with Active Development Partnerships with Chambers of Commerce, Tourism Bureaus, Organizations, Industries, Governments, and Recreational User Groups

Active development partnerships between airports and other organizations facilitate mutually beneficial development of facilities or services toward shared goals. Airports can leverage their position as an economic anchor to create partnerships with public or private entities to promote the development of compatible land uses such as business parks, warehouses, and other uses nearby. As a key component to the economic health of many industries across the state, these active development partnerships support shared goals across industries and encourage a greater mix of economic activity to occur within the state.

Information about active development partnerships were gathered through airport responses during the on-site visits. More than half of all airports system-wide reported active development partnerships with four percent of airports not providing an answer to this question. Eighty-six percent of Commercial Service, all GA-National, and more than half of GA-Regional and GA-Local airports have active development partnerships with other organizations. Less than a third of GA-Community airports and none of the GA-Rural airports that responded to the survey were part of an active development partnership. **Figure 6.38** shows the percent of airports by classification that have active development partnerships with other organizations.

Figure 6.38. Percent of Airports by Classification with Active Development Partnerships



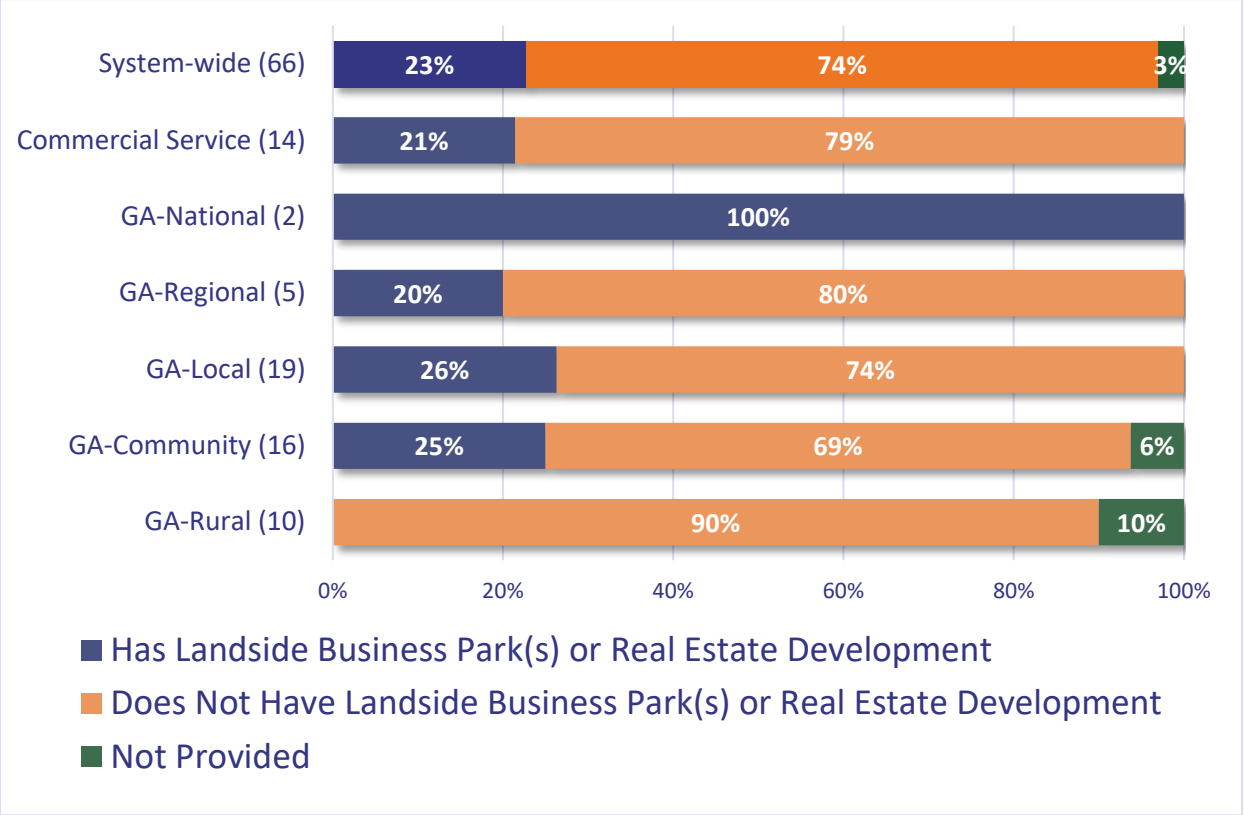
Source: 2018 Inventory & Data Form

6.4.2.2. Percent of Airports with Business Parks or Landside Real Estate Development

Business/commerce parks and other compatible land uses on-airport property promote the occurrence of diverse economic activity and airport users. The presence of on-airport business/commerce parks, warehouses, office space, and other uses indicate the airport's ability to remain resilient in response to changes in the economy through revenue diversification. For smaller airports, the development of these types of facilities may not be practical in terms of cost of development, maintenance, and market viability. Instead, these airports may prefer to focus on the maintenance or expansion of facilities and services based on community needs.

Airports were asked about the presence of business parks or real estate development on their airports through the 2018 Airport Inventory & Data Form. Less than a quarter of system-wide airports reported having these as existing facilities at their airports, with three percent not providing an answer to the question on the survey. Between 20 and 26 percent of Commercial Service, GA-Regional, GA-Local, and GA-Community airports reported having business parks or real estate development on airport property. Of the GA-Rural airports that responded to this question, none had these facilities. **Figure 6.39** presents the results of the survey.

Figure 6.39. Percent of Airports by Classification with Business Parks or Landside Real Estate Development



Source: 2018 Inventory & Data Form

6.4.2.3. Percent of Airports Recognized in Local and/or Regional Comprehensive Plans

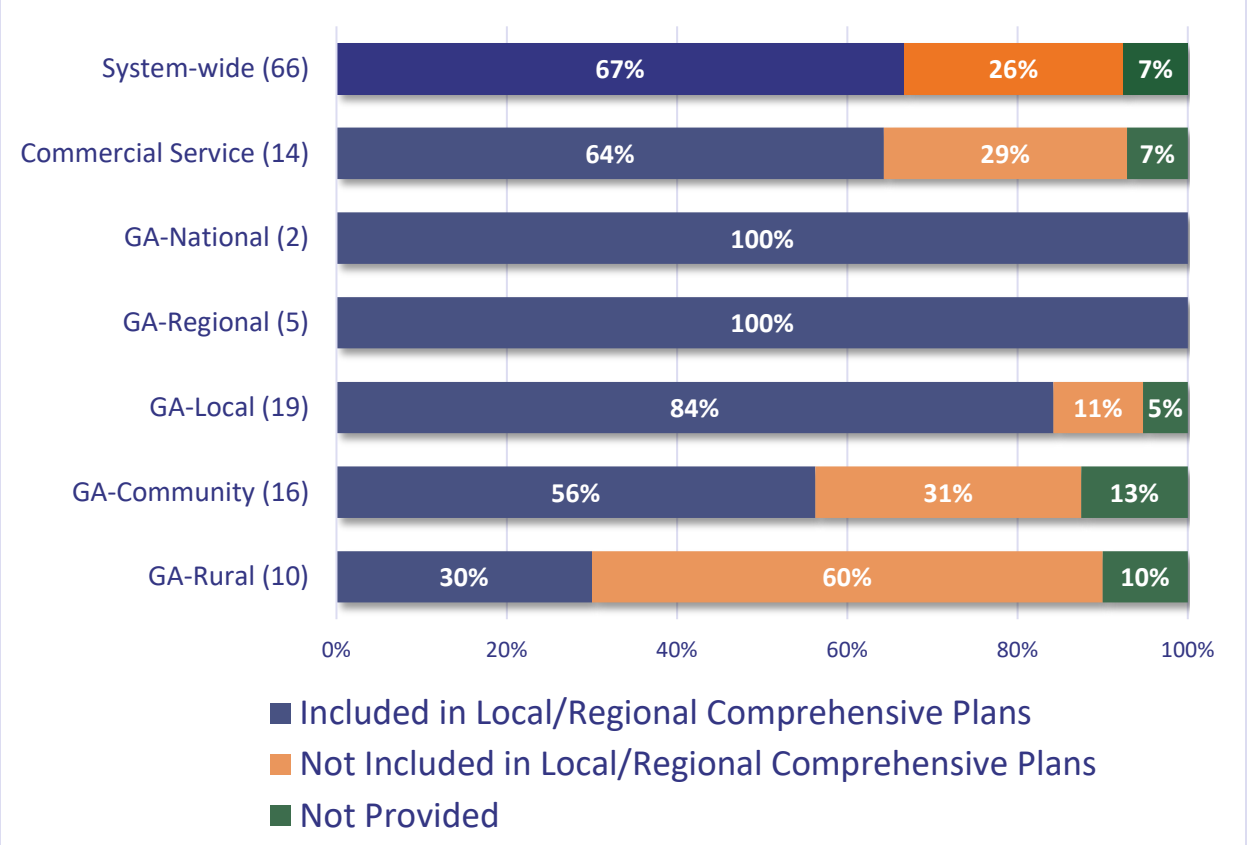
Local and regional comprehensive plans or general plans, similar to aviation system plans, are guiding documents which narrate the goals of a municipality or greater regional area and the tactics developed to achieve them. Through comprehensive plans, decision-makers use these documents to make informed choices that align with the community's long-term goals. These overarching goals require extensive collaborative planning and communication between numerous stakeholders which include government entities, the public, business owners, special interest groups, etc. to work together to achieve these goals through the planning horizon.

Comprehensive plans may include specialized planning areas that highlight unique land use, zoning, or other regulatory planning tools to enhance these areas in the future. Airports should be integrated into a regional and/or local comprehensive plan due to their economic importance, vast land use requirements now and into the future, and requirements for land use and height restrictions surrounding them. Local and regional comprehensive plans guide land use development regulations such as zoning which are critical considerations around airports. A lack of development controls or land buffers surrounding airports can inhibit the ability to expand or modernize airport facilities to accommodate different types of aircraft, services, or additional users. A lack of controls may also result in obstructions or incompatible uses within RPZs, close-in obstructions affecting aircraft

approaches or departures, and those penetrating 14 CFR Part 77 surfaces. Eliminating these types of developments ensures that the airport can respond to future needs appropriately and mitigate safety risks to persons and properties near and on the airport. Proper land use planning conducted as part of regional and/or local comprehensive plans can enhance airport development and strengthen its economic relationship with the surrounding community.

Airports were asked if they are recognized in local and/or regional comprehensive plans. As a result, two-thirds of system-wide airports reported being represented within their local and/or regional comprehensive plans. All GA-National and GA-Regional airports are included in their regional and local plans. GA-Rural airports represent the classification with the least amount of integration into their community's comprehensive plans at 30 percent. **Figure 6.40** displays the percentage of airports that are recognized in their local and/or regional comprehensive plans.

Figure 6.40. Percent of Airports by Classification Recognized in Local and/or Regional Comprehensive Plans



Source: 2018 Inventory & Data Form

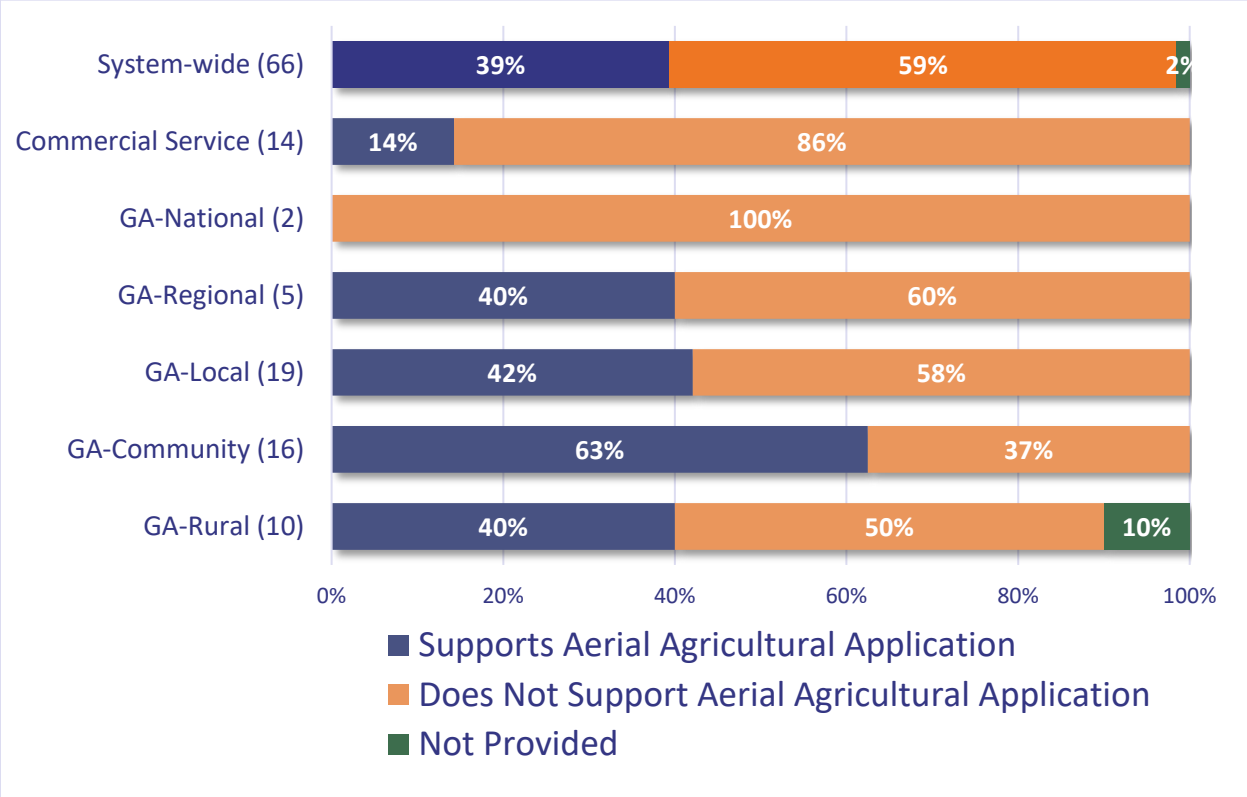
6.4.2.4. Percent of Airports that Support Aerial Agricultural Application

Aerial agricultural application is the utilization of specialized aircraft to perform the necessary functions for healthy crop and/or forest management. Agriculture and agriculture-related industries rely heavily on aerial application operations to protect Colorado's crops such as corn, wheat, potatoes, and oats, from pests and diseases, maintain efficient growing processes, and achieve high crop yields.

Airports that support aerial agricultural applications assist the agriculture industry in maintaining its position as one of the largest contributors to Colorado's GDP.[9] Aerial agricultural application aircraft may be based at a CASP airport or outside of the CASP system. These aircraft have specific needs such as designated chemical mixing and storage areas, depending upon the operator. Many times, these activities are separated from others on the airport due to the potential for contamination or spillage of the chemicals.

Airports were asked if they support and experience aerial agricultural application activity during the on-site visits. Thirty-nine percent of airports system-wide reported supporting aerial agricultural application operations at their airport. GA-Community airports reported the highest share of airports that support aerial agricultural application at 63 percent. GA-National airports report none of their airports support aerial agricultural application. **Figure 6.41** presents the percent of airports by classification that support aerial agricultural application at their airports.

Figure 6.41. Percent of Airports by Classification that Support Aerial Agricultural Spraying



Source: 2018 Inventory & Data Form

[9] Colorado Office of Economic Development and Trade (OEDIT)-*Key Industry: Food & Agriculture*

6.5. Goal: System Viability

System Viability

System viability pertains to the promotion of financial responsibility, protection of investments, and the pursuit of decisions which will improve market stability. Airport infrastructure and maintenance requires large sums of capital investment to ensure that they remain in operational condition. Allowing infrastructure to degrade and reach unacceptable conditions for replacement is oftentimes significantly more expensive than performing routine maintenance to keep them in good condition. To protect the airport's substantial investment, incorporation of pavement management plans is fiscally responsible and integral to extending the life-cycle of current pavements. The opportunities identified through analysis of national aviation and related industries were also taken into consideration for this goal. As aviation demand increases and is projected to continue to increase, the need for more aviation workers grows in direct correlation. Cultivating the next generation of pilots and aviation professionals is imperative to mitigating shortfalls in workforce that could limit Colorado's airports from experiencing future growth.

6.5.1. Performance Measures

This section discusses the results of the PMs associated with the system viability goal category. PMs for this category include the following:

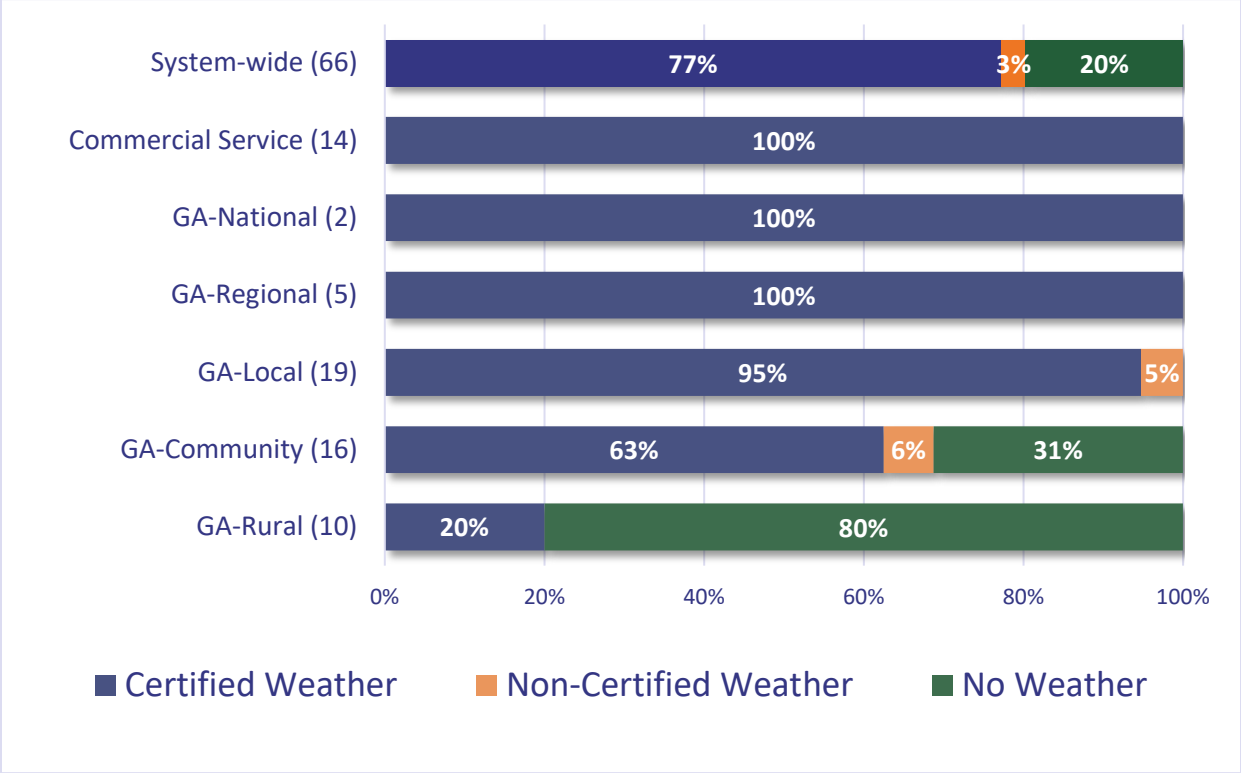
1. Percent of airports with certified on-site weather reporting (AWOS or ASOS)
2. Percent of airports with pavement maintenance programs
3. Percent of airports with an average runway and taxiway pavement condition index (PCI) of 70 or greater

6.5.1.1. Percent of Airports with Certified On-Site Weather Reporting (AWOS or ASOS)

Automated weather observing systems (AWOS), automated surface observing systems (ASOS), and automated UNICOM systems communicate meteorological conditions to pilots to safely navigate aircraft to and from the airport as well as navigate through nearby airspace. These systems report on weather environments including all or some of the following: ceilings, visibility, precipitation, wind, barometric pressure and other elements that impact flight conditions.

Weather reporting stations at CASP airports were identified as part of the inventory process, however, identifying those that are "certified" was of key importance related to this SI. A certified weather reporting station reports weather data to the National Airspace Data Interchange Network (NADIN). The NADIN is a private FAA data network accessible to only approved users. Seventy-seven percent of system-wide airports have certified weather reporting located on their airports. Three percent of system-wide airports possessed a non-certified weather reporting system and 20 percent did not have a system. GA-Local, GA-Community, and GA-Rural airports were identified as having less than 100 percent of their airports with a certified weather-reporting system on-site. Twenty percent of GA-Rural airports had a certified system and 80 percent did not have an on-site weather reporting system at all. **Figure 6.42** reports the presence of certified or non-certified weather reporting stations at system airports.

Figure 6.42. Percent of Airport by Classification with Certified On-Site Weather Reporting (AWOS or ASOS)



Source: 2018 Inventory & Data Form

6.5.1.2. Percent of Airports with Pavement Maintenance Programs

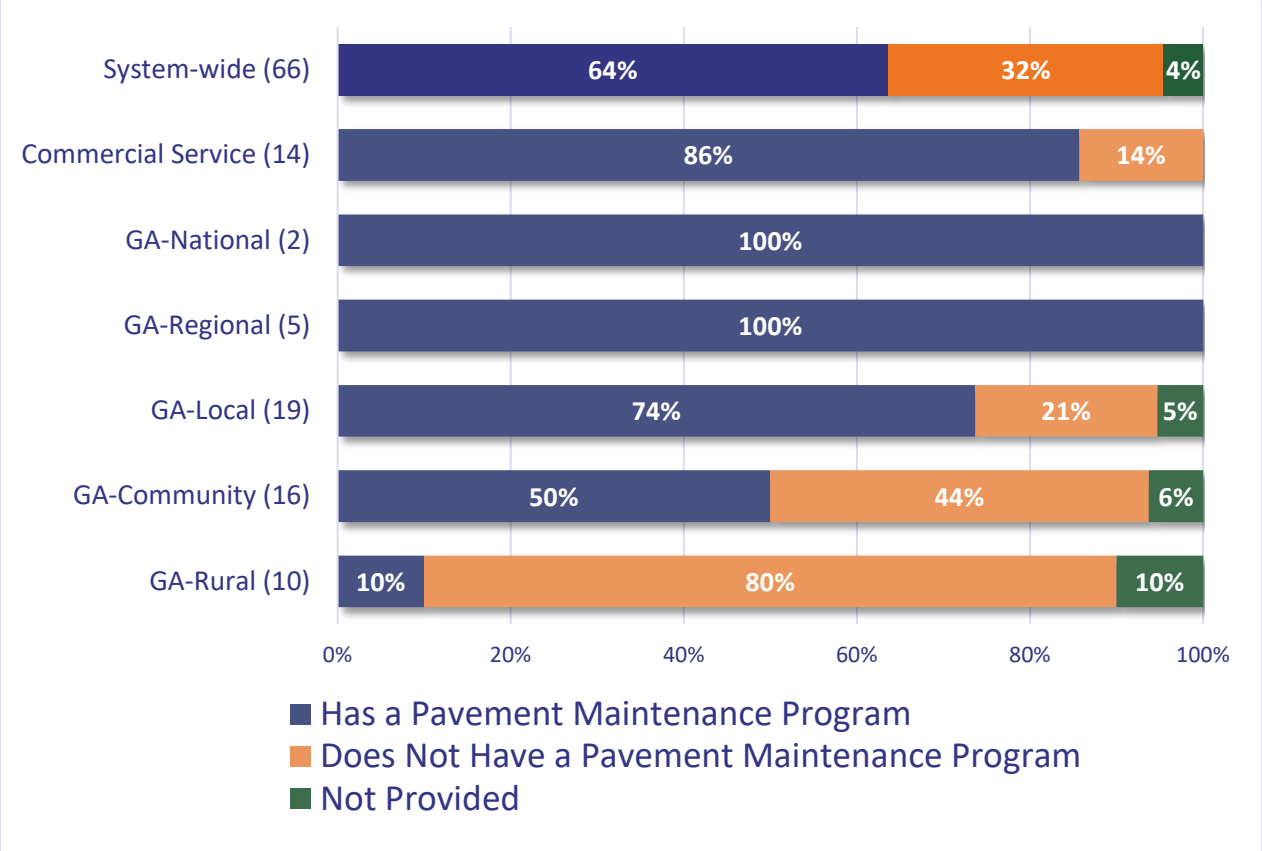
The conditions of an airport's pavements are critical to the safe navigation of aircraft on runways, taxiways, and aprons. Pavement rehabilitation may be one of the single-most expensive capital investments that an airport can make, therefore, proper evaluation of conditions and maintenance over time is essential to protecting this investment. An airport pavement maintenance program employs a system of evaluative tools and schedules for airports to maintain their runways and prepare for pavement rehabilitation needs in the future. A pavement maintenance program provides important indicators to understand current pavement conditions and uses a set of indicators to assess the rate of degradation to predict when rehabilitation should occur. Executing maintenance and rehabilitation (M&R) techniques to keep the pavement from dropping below fair or poor conditions is estimated to be four to five times less expensive than rehabilitating pavement conditions when it drops below those thresholds[10].

Figure 6.43 shows the percentage of airports by classification that have a program to maintain their pavements. Out of all airports system-wide, 64 percent have PMPs that are used in maintenance decisions. Of these, all GA-National and GA-Regional airports and 86 percent of Commercial Service

[10] FAA AC 150/5380-7B " Airport Pavement Management Program" October 2014: https://www.faa.gov/documentlibrary/media/advisory_circular/150-5380-7b.pdf

airports have these plans. Inversely, 80 percent of GA-Rural airports did not have a pavement maintenance program, with 10 percent reporting having a plan, and 10 percent not responding to the survey question.

Figure 6.43. Percent of Airports by Classification with Pavement Maintenance Programs



Source: 2018 Inventory & Data Form

6.5.1.3. Percent of Airports with an Average Runway and Taxiway Pavement Condition Index (PCI) of 70 or Greater

While the previous PM identified the availability of pavement maintenance programs, this PM addresses the current pavement conditions specific to runways and taxiways. As previously noted, maintaining adequate pavement conditions is one of the largest costs to an airport and implementing proper pavement management techniques protect these capital investments and increase the usable life of paved areas. The pavement condition index (PCI) is the industry standard used to represent the current state of the paved surface on a scale from 0 (unacceptable/failed) to 100 (new/perfect condition). Paved surfaces with a PCI rating of 70 are in "fair" condition. Maintaining a PCI rating of 70 or higher significantly increases the usable life of the paved surface and is considerably cheaper than investing in major rehabilitation projects if runway and taxiway pavements drop below this threshold.

CDOT gathers and maintains their own pavement data for system airports. **Table 6.8** displays the results of CDOT's data collection for system airports for 2018. The weighted average PCI is derived from the collective averages of all primary surfaces by type in the system. Paved surfaces with greater

total surface area are given a higher weight than those with less area. Therefore, airports with larger primary runways or applicable surface areas will have more weight than smaller, single-runway, GA airports with less surface area. The weighted average PCI for runways and taxiways is above fair conditions. Overall, CDOT's report shows that the pavement conditions in the system exceed the 70 PCI threshold.

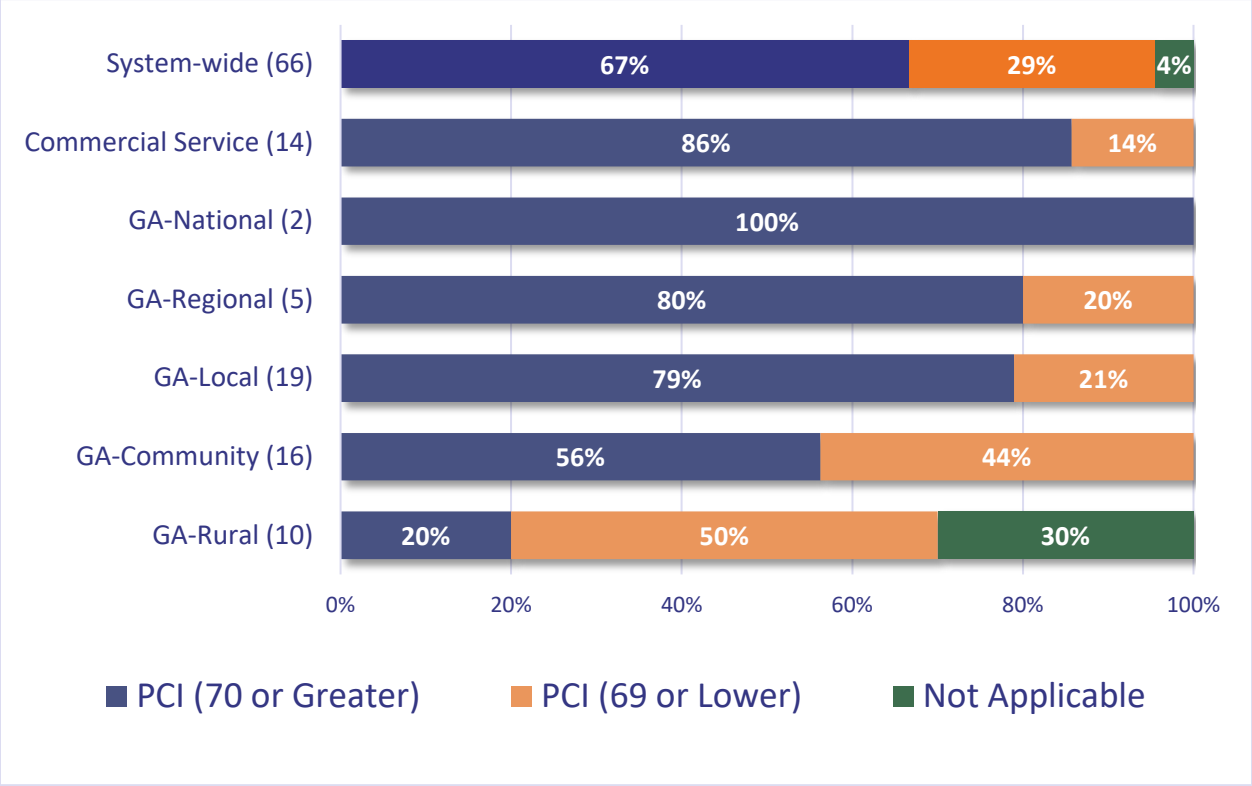
Table 6.8. 2018 PCI Ratings for System Airports by Area

PCI Data Gathered from CDOT's PCI Program					
Use Category	**Number of Sections**	**Total Area (Sq Ft.)**	**Arithmetic Average PCI**	**Average PCI Standard Deviation**	**Weighted Average PCI**
Apron	263	24,032,501.59	73.31	23.68	72.73
Helipad	5	40,036.00	70.40	37.34	59.68
Runway	111	48,974,189.21	76.60	19.83	79.04
Taxiway	580	36,846,841.17	74.21	21.47	75.34
All	**959**	**109,893,567.97**	**74.22**	**22.05**	**76.41**

Source: CDOT Pavement Evaluation and Management, 2018

As part of the system performance analysis, information about PCI conditions were gathered at the micro-level to gain insights into the conditions on an airport-by-airport basis. As such, the primary runway for each airport was reviewed to determine the PCI rating for that airport. Overall, 67 percent of airports' primary runways were rated at 70 or greater. One hundred percent of the GA-National airports had primary runways at or about a PCI rating of 70. Commercial Service, GA-Regional, and GA-Local airports have the next highest representation of airports with PCI ratings at 70 or higher. Thirty percent of GA-Rural airports were deemed as not applicable, as they did not have a paved runway. **Figure 6.44** summarizes the results of the analysis by airport classification.

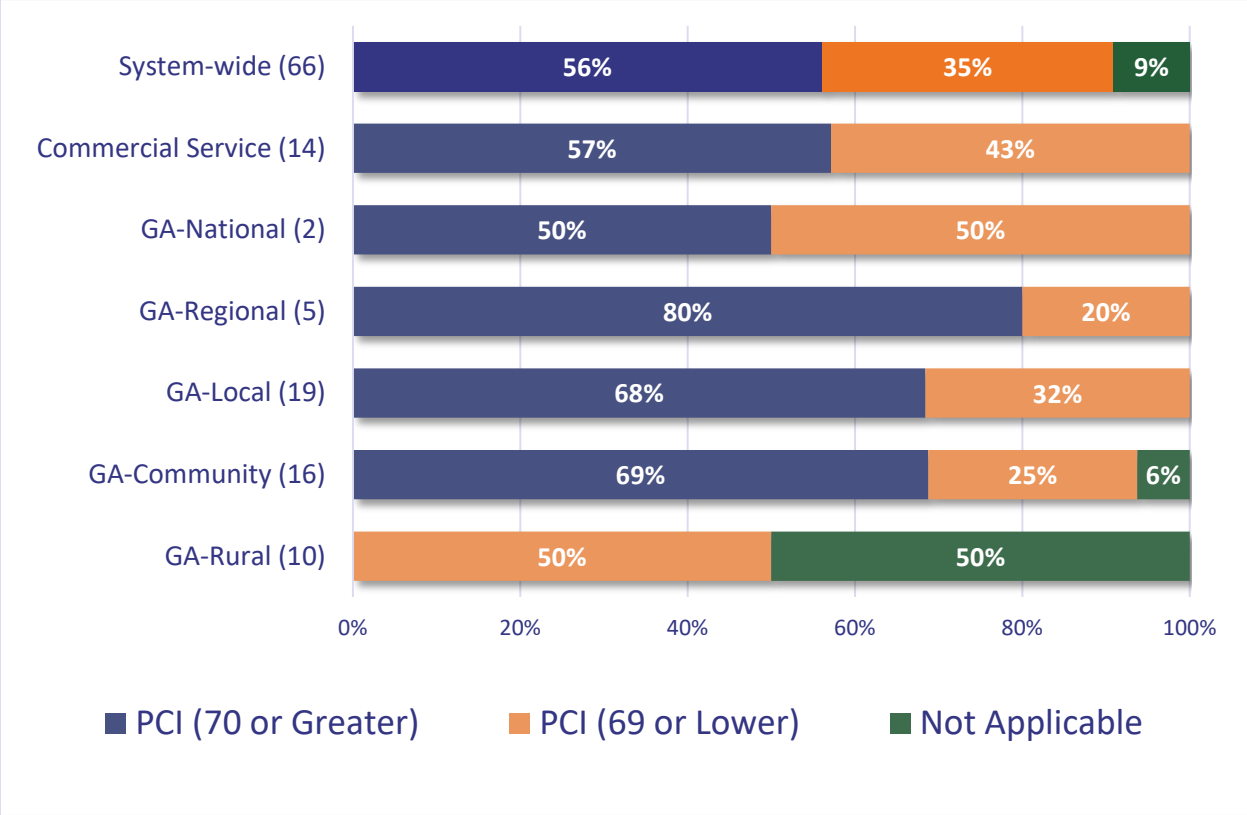
Figure 6.44. Percent of Airports by Classification with a Primary Runway PCI of 70 or Greater



Source: CDOT Pavement Evaluation and Management, 2018

Primary taxiway PCIs at CASP airports were also examined and presented in **Figure 6.45**. System-wide, 56 percent of CASP airports' primary taxiways have a PCI of 70 or greater. Of the GA-Rural airports with a primary taxiway, none have an average PCI of 70 or greater. At least 50 percent of Commercial Service, GA-National, GA-Regional, GA-Local, and GA-Community airports have a primary taxiway PCI of 70 or greater.

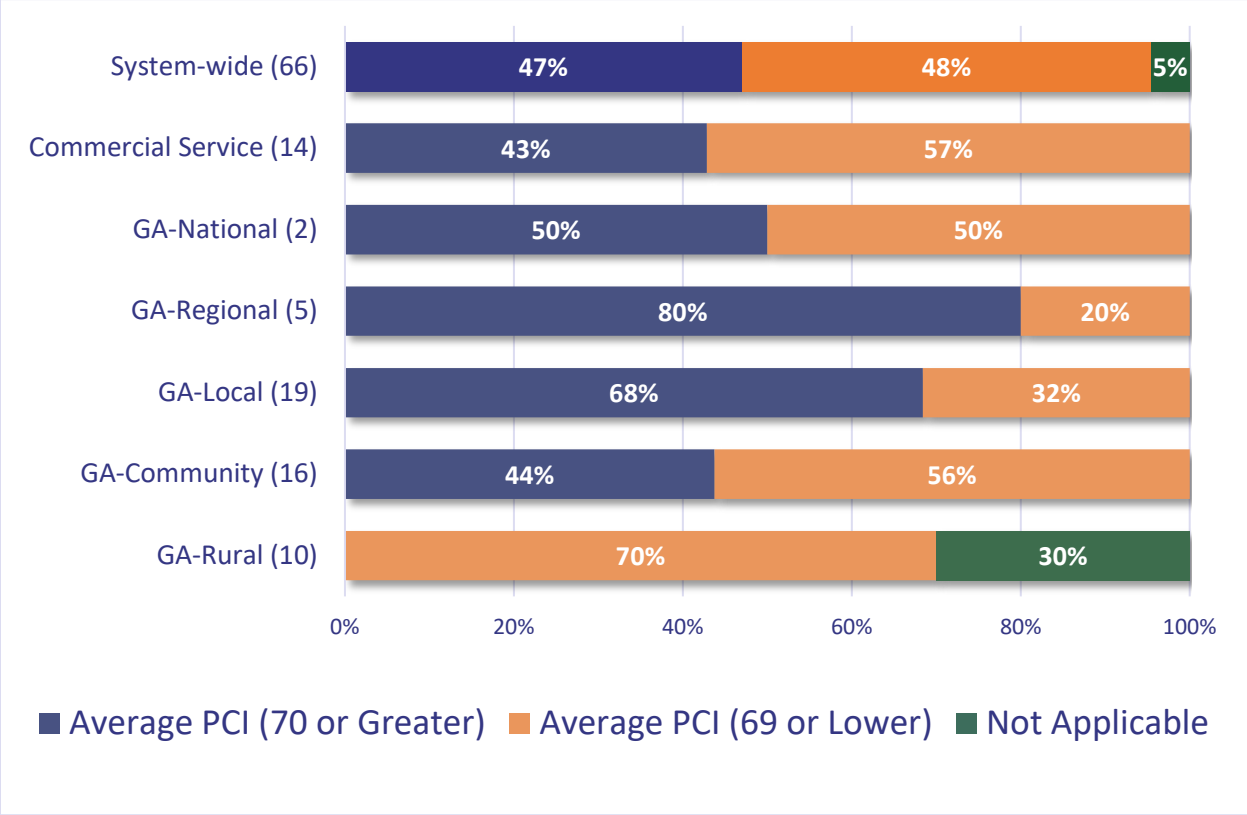
Figure 6.45. Percent of Airports by Classification with an Average Primary Taxiway PCI of 70 or Greater



Source: CDOT Pavement Evaluation and Management, 2018

The PM combines and analyzes the average PCI ratings for both the primary runway and taxiway. If the average PCI for the primary runway and the average PCI for the taxiway for the primary runway are both at or above 70, the airport is considered meeting the PM. A little less than half of all airports in the system meet the PM as described. GA-Regional airports have the highest percentage of airports that have a combined PCI rating of 70 or greater. 70 percent of GA-Rural airports do not meet the runway and taxiway PCI guidelines with 30 percent not having an applicable paved area. **Figure 6.46** shows the airports by classification whose primary runway and taxiway both have PCI ratings of 70 or greater.

Figure 6.46. Percent of Airports by Classification with an Average Primary Runway and Primary Taxiway PCI of 70 or Greater



Source: CDOT Pavement Evaluation and Management, 2018

6.5.2. System Indicators

This section discusses the results of the SIs associated with the system viability goal category. SIs for this category include the following:

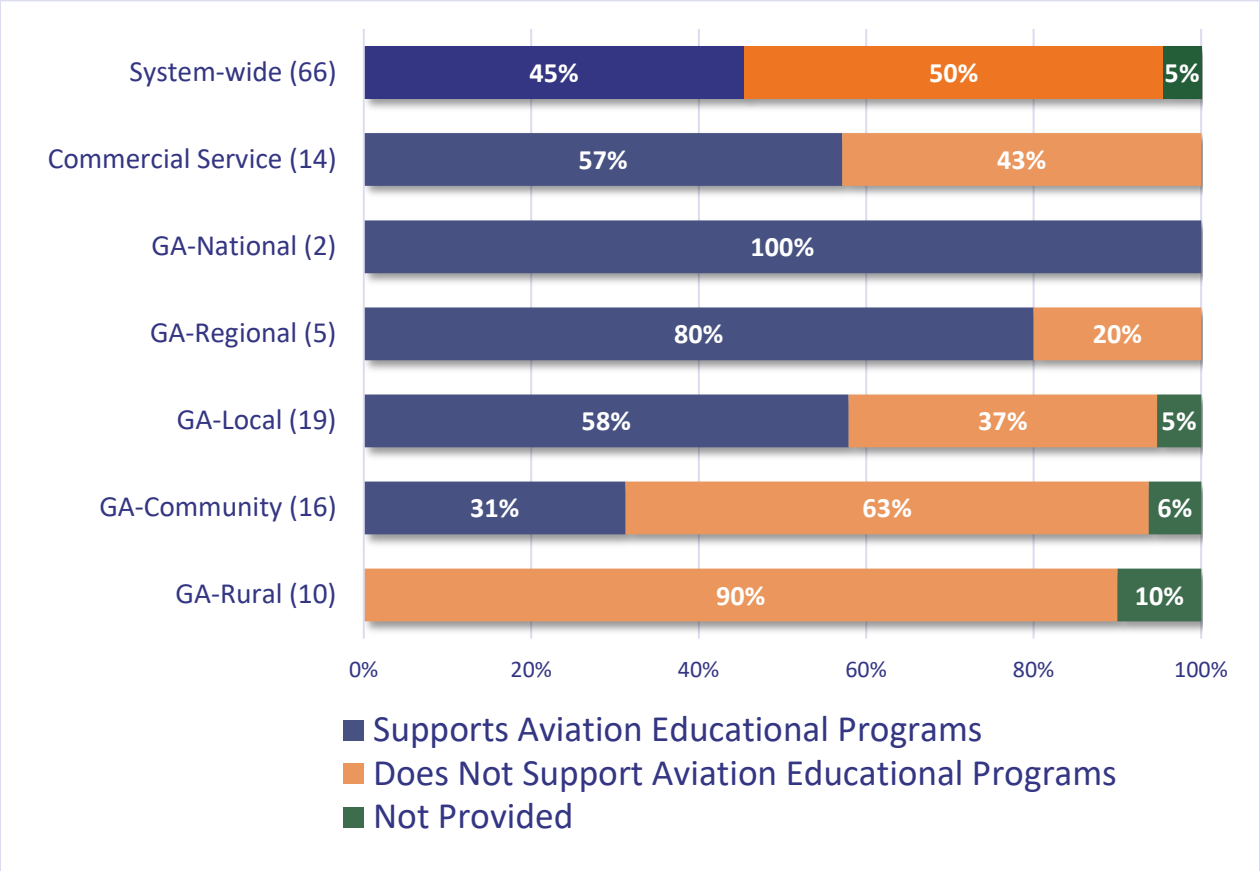
1. Percent of airports that support aviation educational programs
2. Percent of airports with a sustainability plan
3. Number of Colorado pilots per capita

6.5.2.1. Percent of Airports that Support Aviation Educational Programs

Aviation and aerospace industries are facing a shortage in workforce especially as these industries continue to rapidly expand. Aviation education programs are essential to providing pathways and generating job interests in these fields. A number of new federal investment programs have been approved aimed at promoting careers in aviation and sufficiently preparing the next generation of aviation professionals. Airport involvement in facilitating educational programs is imperative to the growth of the aviation workforce. Airports may offer their own aviation educational programs, and these may take the form of, but are not limited to: hosting field trips, speaking at schools, hosting workshops, teaching higher education courses focused on aviation, offering workshops and technical skills training, etc.

Airport managers were asked if their airport supports aviation educational programs. The responses showed that less than half of all airports system-wide report supporting aviation education programs at their airport. GA-National, GA-Regional, GA-Local, and Commercial Service airports respectively represent the classifications with the most representation for having an aviation educational program at their airport. Of the GA-Rural airports, 90 percent did not support an educational program and 10 percent did not respond. **Figure 6.47** presents the percentage of airports by classification that supports some form of aviation educational program.

Figure 6.47. Percent of Airports by Classification that Support Aviation Educational Programs



Source: 2018 Inventory & Data Form

6.5.2.2. Percent of Airports with a Sustainability Plan

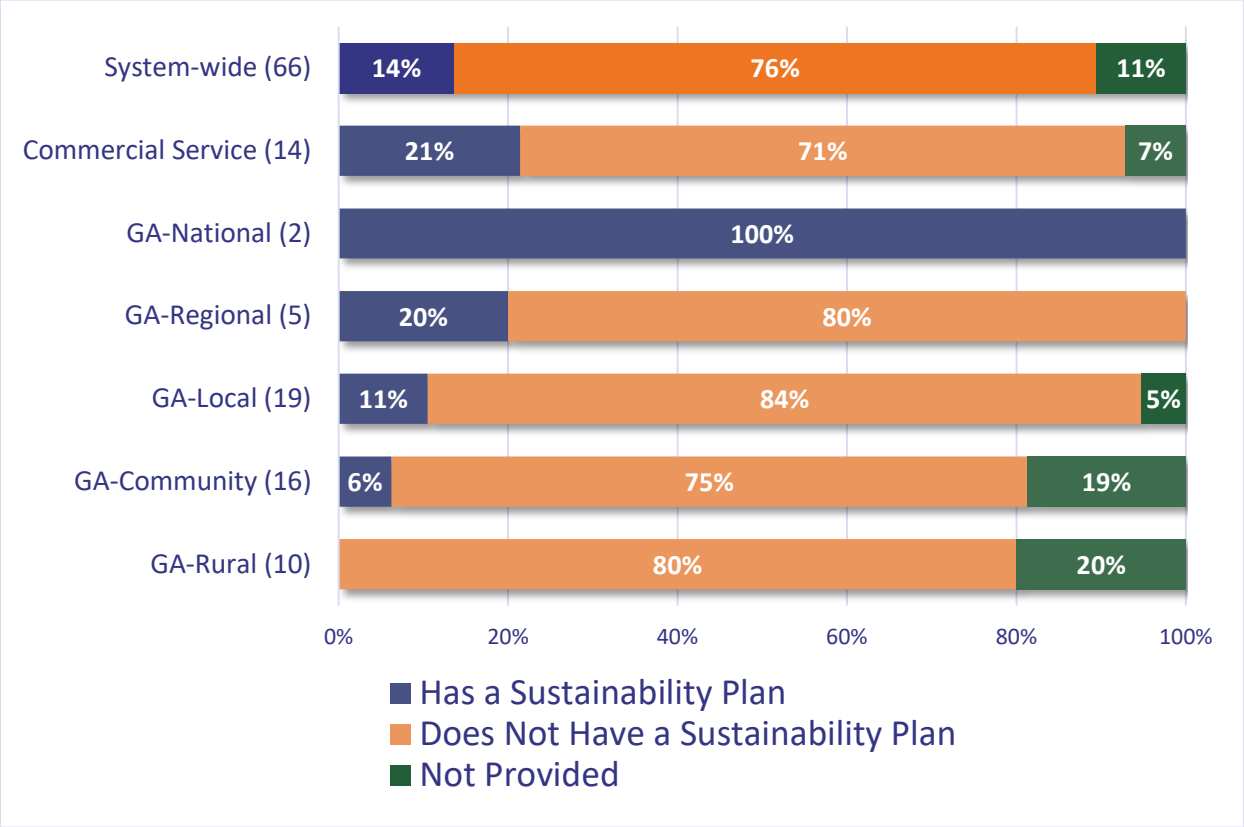
Sustainability is a broadly defined term and as such, airports can establish their own definitions and approaches to achieve their own unique vision of sustainability. Airports across the U.S. are moving towards the adoption of sustainability plans to continually align their actions with goals such as reducing their environmental impact, advancing economic stability, and ensuring the airport fits the needs of the local community. Airports can adopt a sustainability master plan, which is typically incorporated into the airport master plan and/or prepare a sustainability management plan, which is a standalone written document, or portion of a larger airport or community document/plan which specifically addressed the community's efforts to ensure the airport's environmental, operational,

social and/or economic sustainability. Due to the importance of implementing sustainability initiatives at airports, Colorado airports are able to explore grant funding opportunities offered by the FAA, CDOT, local government entities, energy companies, etc. to assist in funding the development of an airport's sustainability planning document.

As mentioned in **Chapter 2. Inventory of System Condition**, in 2016, CDOT's Division of Aeronautics implemented the Colorado Airport Sustainability Program that is intended to guide and provide necessary resources for airports to prepare their own sustainability plans. The goal of the program is to ultimately advance economic, social, operational, and environmental sustainability at airports in Colorado through their free, user-friendly, web-based toolkit. This program has resulted in the completion of four sustainability plans for Rifle-Garfield County Regional (RIL), Centennial Airport (APA), Rocky Mountain Metropolitan Airport (BJC), and Fremont County (1V6). These plans are used as models for other airports looking to develop their own sustainability plans through the program.

During the inventory process, airports were asked if they had a sustainability plan. Overall, 30 percent of airports system-wide reported having sustainability plans and 11 percent did not respond to the question on the survey. One hundred percent of GA-National and over half of Commercial Service and GA-Regional airports had a sustainability planning document. Less than one-third of GA-Local airports, less than a tenth of GA-Community, and no GA-Rural airports reported having sustainability plans. **Figure 6.48** shows the results of the survey responses and reflect the percentage of airports by classification with sustainability plans.

Figure 6.48. Percent of Airports by Classification with Sustainability Plans

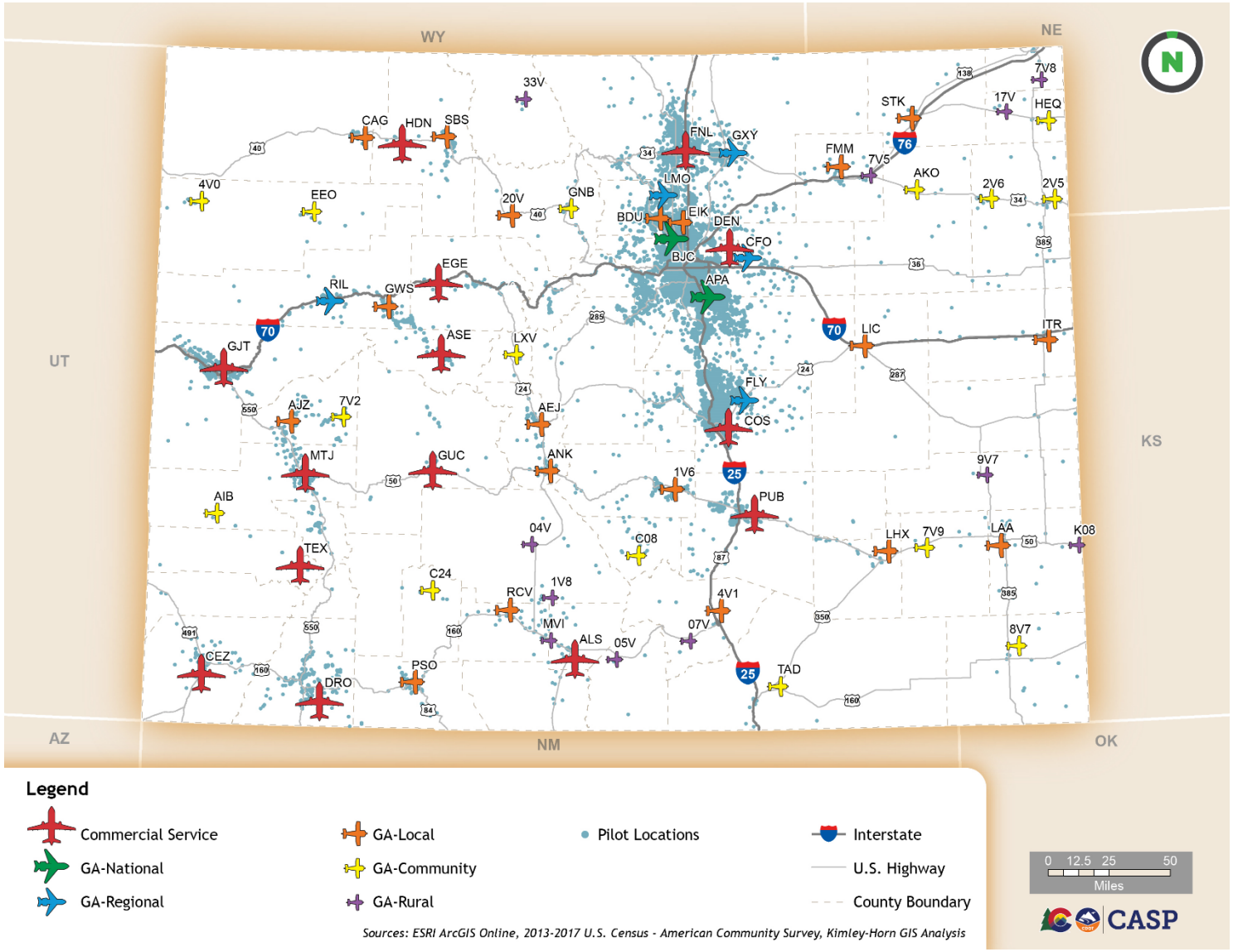


Source: 2018 Inventory & Data Form

6.5.2.3. Number of Colorado Pilots Per Capita

The number of pilots within a region or state can oftentimes give direction to the propensity of aviation demand, especially for GA activity. Because of this correlation, the number of Colorado registered pilots and their locations were pulled from FAA databases and mapped. Of the 18,094 registered pilots in Colorado as of October 2019, 12,586 (70 percent) are in Arapahoe, Boulder, Denver, Douglas, El Paso, Jefferson, and Larimer counties. As illustrated in **Figure 6.49**, pilot density is most prevalent around the Denver and Colorado Springs areas.

Figure 6.49. Colorado Registered Pilots



6.6. Facility and Service Objectives

In addition to evaluating airport's capabilities and the system's performance based on the PMs and SIs, the 2020 CASP identified a series of facility and service objectives to guide development at system airports. The facility and service objectives are designed to provide guidance on the minimum level of development that airports should strive to achieve based on their role or function within the system as determined through their classification. Therefore, these objectives are not intended to be mandates or requirements, but recommended standards to help guide airports to optimally perform their roles within the system. In general, airports that serve larger, more sophisticated aircraft and support diverse aviation activities typically require more extensive services and facilities, while smaller airports with limited aircraft operations and activities necessitate fewer.

It is important to note that if an airport does not meet a particular objective it does not necessarily indicate a development or improvement project should be pursued. Instead, an airport should consider if its existing facilities and services accommodate current and anticipated needs during the master planning process or through discussions with CDOT Division of Aeronautics staff. From federal (i.e. FAA) and state (i.e. CDOT) perspectives, specific projects must be justified in an airport-specific study (e.g., master plan) and included on the ALP before funding can typically be considered. While the 2020 CASP provides the framework of statewide needs, airport-specific analyses are needed to determine the facilities and service objectives and related improvement projects appropriate for a specific airport.

The CASP facility and service objectives are presented in this section, and divided into the following categories:

6.6.1 Airfield facility objectives
6.6.2 Lighting/NAVAIDs facility objectives
6.6.3 Airport facility objectives
6.6.4 Service/Other objectives
6.6.5 Summary of Facility and Service Objectives

Each category is separated into its own subsection in the subsequent pages, and the subsections include a bar chart that indicates the status of each airport classification within a specific facility or service objective related to that category. A summary bar chart demonstrating the system-wide results for each objective concludes the facility and service objective section. Individual airport report cards were developed to depict each system airport's facility and service objectives status, comparing existing facilities and services to the objectives and noting where each airport achieved the objective. These report cards can be found in **Appendix B. Airport Report Cards**.

6.6.1. Airfield Facility Objectives

The airfield facility objectives include the components of an airport's facilities directly related to airfield pavements. Airfield facilities are a major component in an airport's ability to support aviation operations and statewide needs. The following airfield facilities were assessed for Colorado system airports, with specific objectives assigned for each airport's classification:

6.6.1.1 Airport Reference Code (ARC)
6.6.1.2 Primary Runway Length

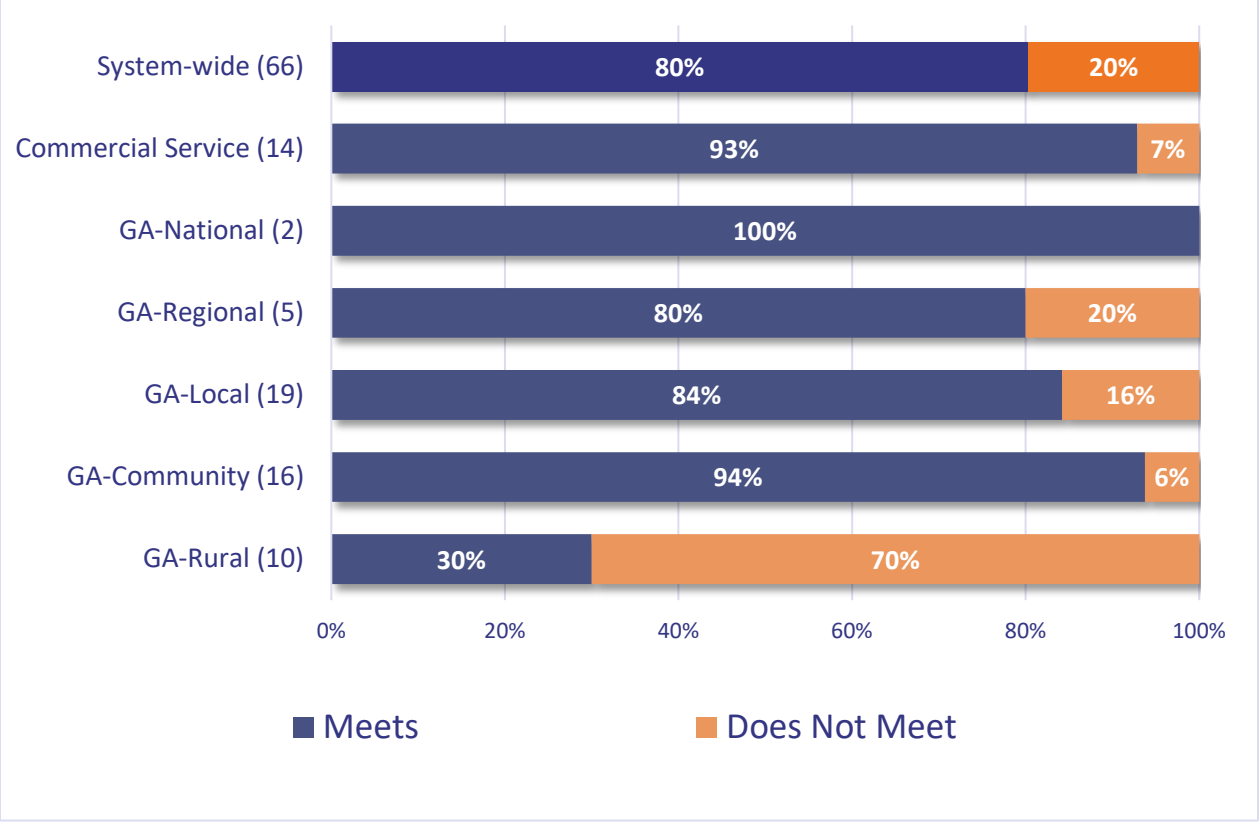
6.6.1.3 Primary Runway Width
6.6.1.4 Primary Runway Strength
6.6.1.5 Taxiway Type
6.6.1.6 Runway Markings

6.6.1.1. Airport Reference Code (ARC)

An airport's ARC is indicative of the most demanding aircraft that regularly operates at an airport. An airport's ARC denotes the primary runway's design code (RDC), or the specification such as runway length, width, separation distances, etc. that are critical for the safe operation of aircraft on the runway. Although the ARC is used for planning and design purposes, the FAA states that the ARC does not expressly limit the aircraft that may be able to operate safely on the airport. Due to the relationship between the ARC and an airport's primary RDC which dictates runway requirements, the ARC is included as an objective for each airport.

In total, 80 percent of the Colorado system meets its ARC objective relative to its classification. At least 80 percent of all airport classifications are meeting the ARC objective, with all GA-National airports meeting this objective, and GA-Rural airports as the outlier with only 30 percent of airports meeting the ARC objective. **Figure 6.50** summarizes ARC objective performance at Colorado system airports.

Figure 6.50. Percent of Airports by Classification Meeting ARC Objectives



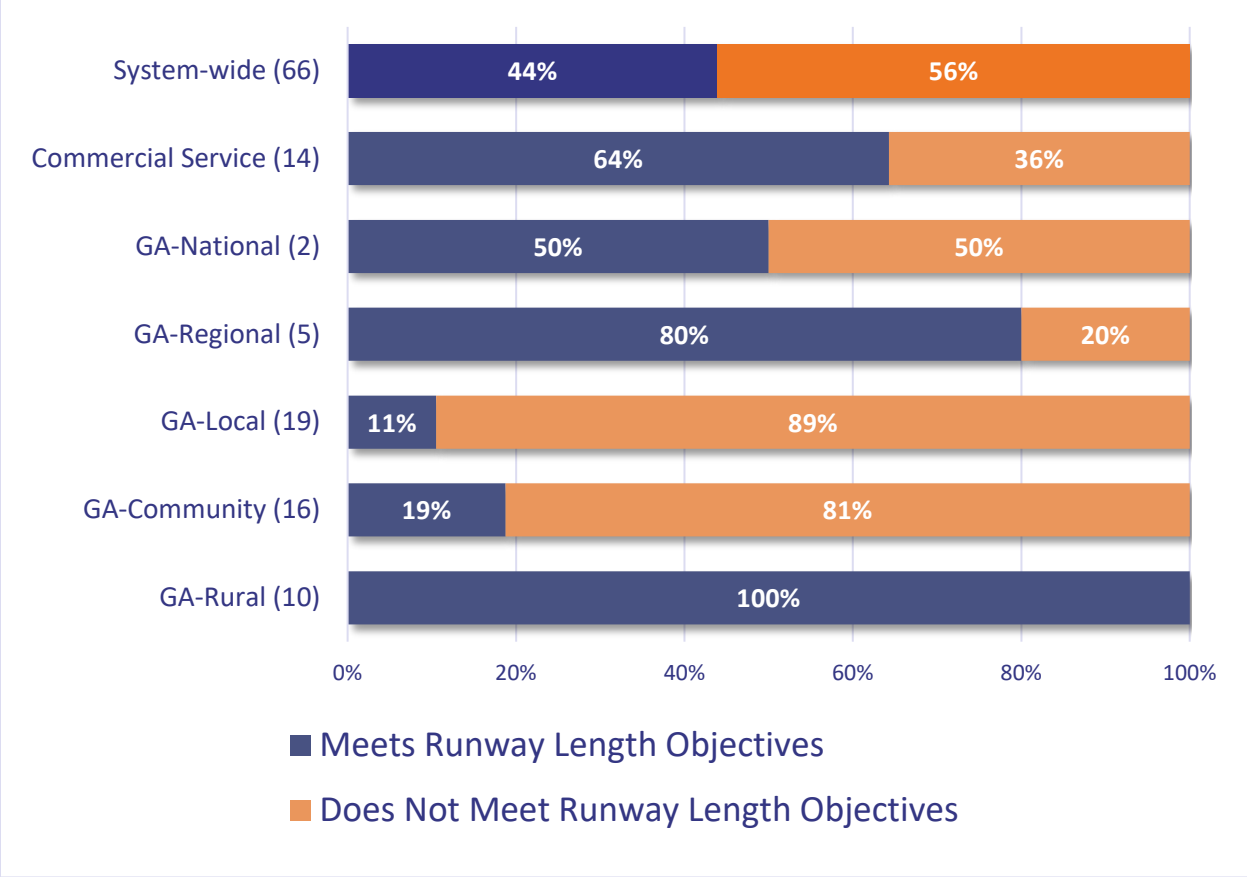
Source: 2018 Inventory & Data Form

6.6.1.2. Primary Runway Length

The length of the runway is one of the most important factors determining what types of aircraft can land at an airport. In general, longer runways allow for the operation of more demanding, high performance aircraft. Primary runway length objectives for Commercial Service, GA-National, and GA-Regional were determined using the runway lengths specified for the critical aircraft as reported in the airport's ALP or master plan. GA-Local and GA-Community runway length objectives were determined based on accommodation of 100 percent and 95 percent, respectively, of small aircraft adjusted for elevation and mean maximum daily temperature during the hottest month. The runway length analysis was conducted using Figure 2-1 in FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*. The GA-Rural airports are recommended to maintain their existing runway lengths.

Figure 6.51 summarizes the runway length objective performance by airport classification. Sixty-four percent of Commercial Service airports met their primary runway length objective. One of the two GA-National airports did not meet their runway length objective. Eighty percent of GA-Regional airports met their runway length objective. Eleven percent of GA-Local and all GA-Rural airports meet their runway length objective. Overall, 44 percent of system airports meet their primary runway length objective.

Figure 6.51. Percent of Airports by Classification Meeting Primary Runway Length Objective



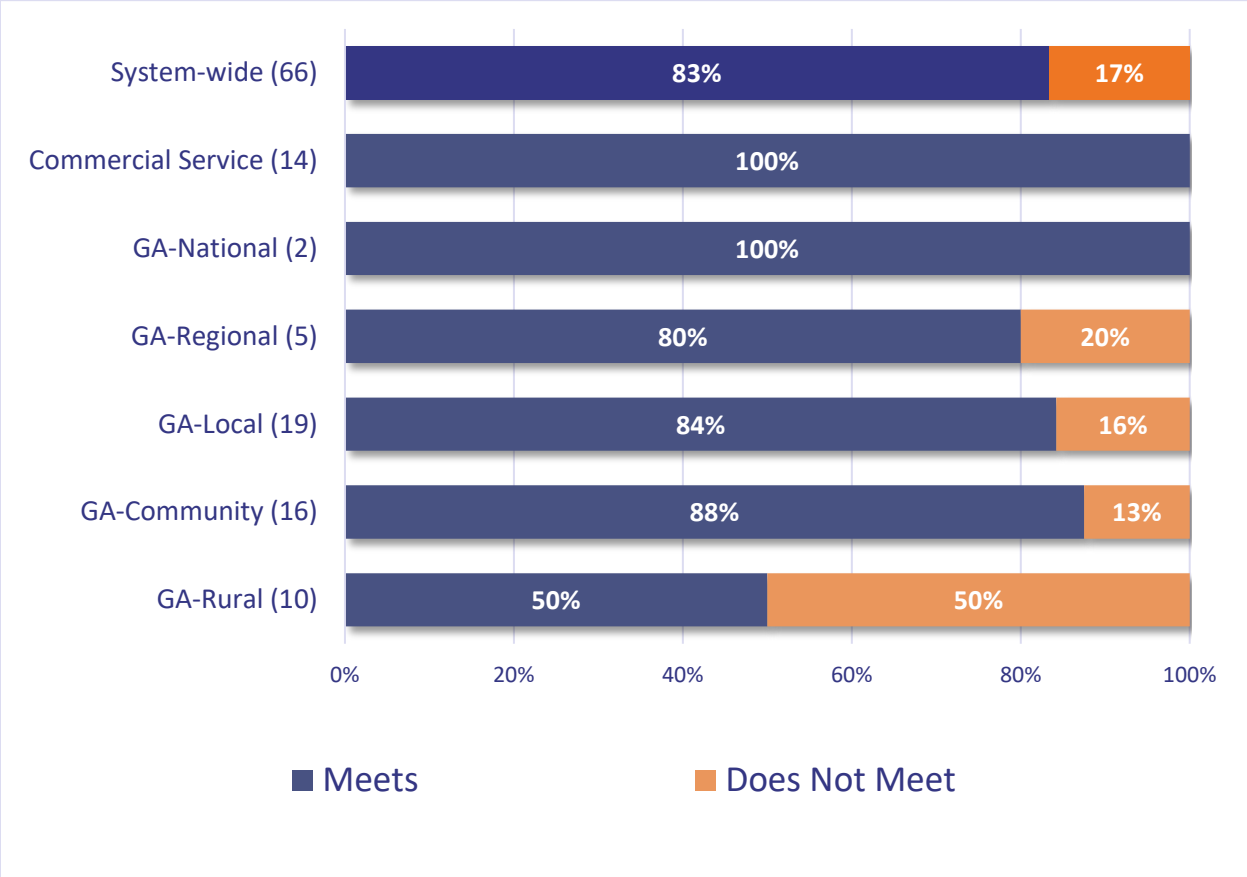
Source: 2018 Inventory & Data Form

6.6.1.3. Primary Runway Width

Runway width, similar to runway length, is an important component of maintaining safety standards at an airport. Primary runway width objectives vary between airport classifications and range from 150 feet wide for Commercial Service airports to 60 feet wide for GA-Rural airports.

Figure 6.52 summarizes the results of the primary runway width objective analysis by airport classification. System-wide, 83 percent of airports are meeting this objective. All Commercial Service and GA-National airports meet their primary runway width objective. All airport classifications, excluding GA-Rural, had 80 percent or more of their airports meeting the primary runway width objective. Fifty percent of GA-Rural airports meet the 60-foot wide objective.

Figure 6.52. Percent of Airports by Classification Meeting Primary Runway Width Objective



Source: 2018 Inventory & Data Form

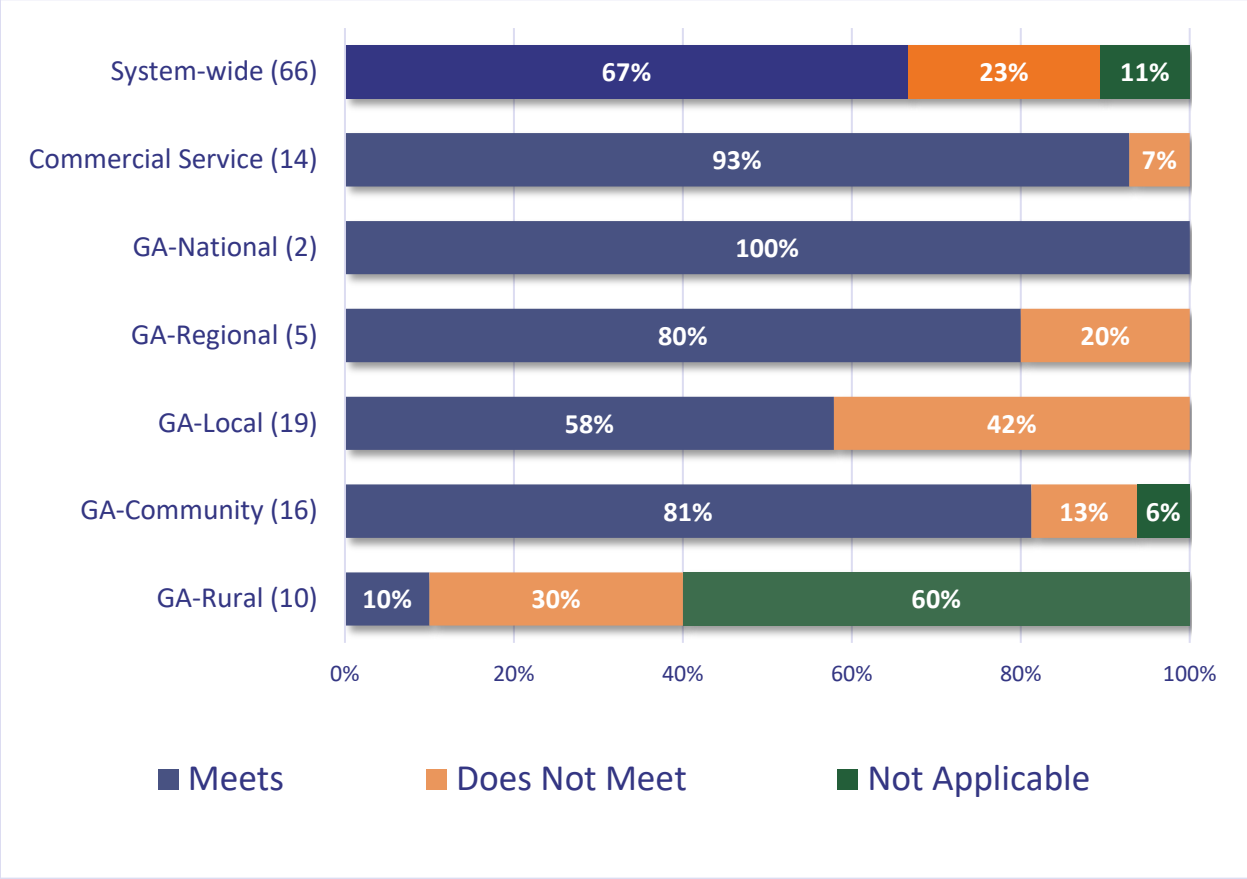
6.6.1.4. Primary Runway Strength

Runways are the most important facility at an airport and therefore should be strong enough to accommodate the most demanding, regular-use aircraft. It was determined that the objective for Commercial Service and GA National airports is 60,000 pounds, while GA-Regional and GA-Local have an objective of 30,000 pounds. GA-Community and GA-Local were assigned a runway strength objective of

12,500 pounds. For this analysis, only total weight was considered. Differentiation between single-wheel, dual wheel, and others was not included.

Figure 6.53 summarizes primary runway strength facility objective performance by airport classification. Overall, 67 percent of system airports are meeting their respective runway strength objective. Ninety-three percent of Commercial Service, 80 percent of GA-Regional, and 81 percent of GA-Community airports meet this objective at over 80 percent, with almost 60 percent of GA-Local airports achieving the objective. One hundred percent of GA-National airports meet their respective runway strength objectives. Ten percent of GA-Rural airports are meeting their runway strength objective. This objective does not apply to the three GA-Rural airports with turf runways. Three GA-Rural airports and one GA-Community airport did not provide runway strength data. The airports with turf runways or that did not provide runway strength data resulted in a "not applicable" outcome for this objective.

Figure 6.53. Percent of Airports by Classification Meeting Primary Runway Strength Objectives



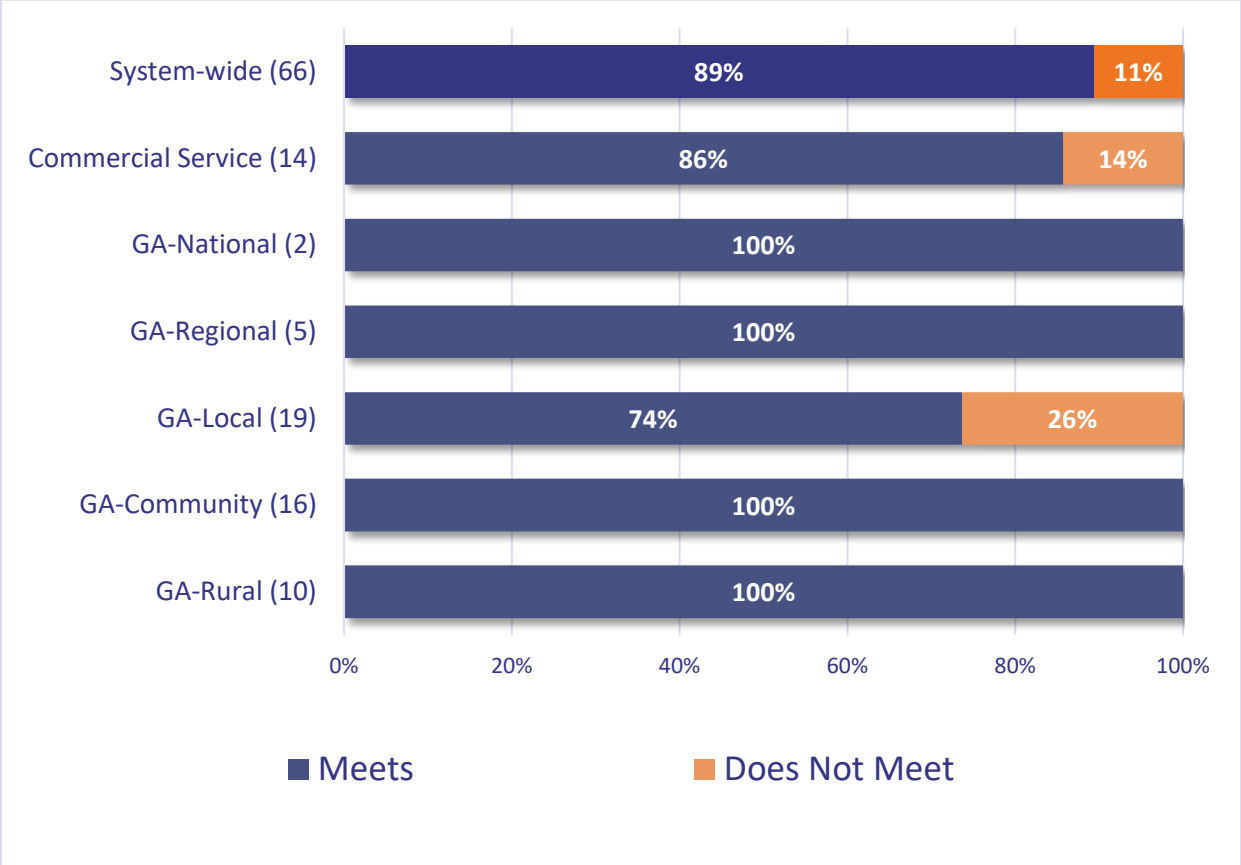
Source: 2018 Inventory & Data Form

6.6.1.5. Taxiway Type

At the most basic level, taxiways are constructed to facilitate aircraft movements between the runways and aircraft parking areas. However, as airports take on more substantial activity volumes, taxiways also become necessary to improve operational efficiency and safety. As mentioned in **Chapter 2. Inventory of System Condition**, there are four types of taxiways that exist at CASP airports. For this objective, Commercial Service, GA-National, and GA-Regional airports were assessed by the existence of a full parallel taxiway, while GA-Local airports were assessed for availability of partial-parallel taxiways, and GA-Community in the form of a turn-around taxiway. GA-Rural airports have an objective to maintain their existing taxiway type. Taxiway types for this analysis refer to the airport's primary taxiway only.

Figure 6.54 summarizes taxiway type objective performance by airport classification. System-wide, 89 percent of system airports meet their taxiway facility objective relative to classification. All GA-National, GA-Regional, GA-Community and GA-Rural airports meet the objective, while 74 percent of GA-Local airports met the taxiway type objective. Eighty-six percent of Commercial Service airports are meeting their objective.

Figure 6.54. Percent of Airports by Classification Meeting Taxiway Objectives

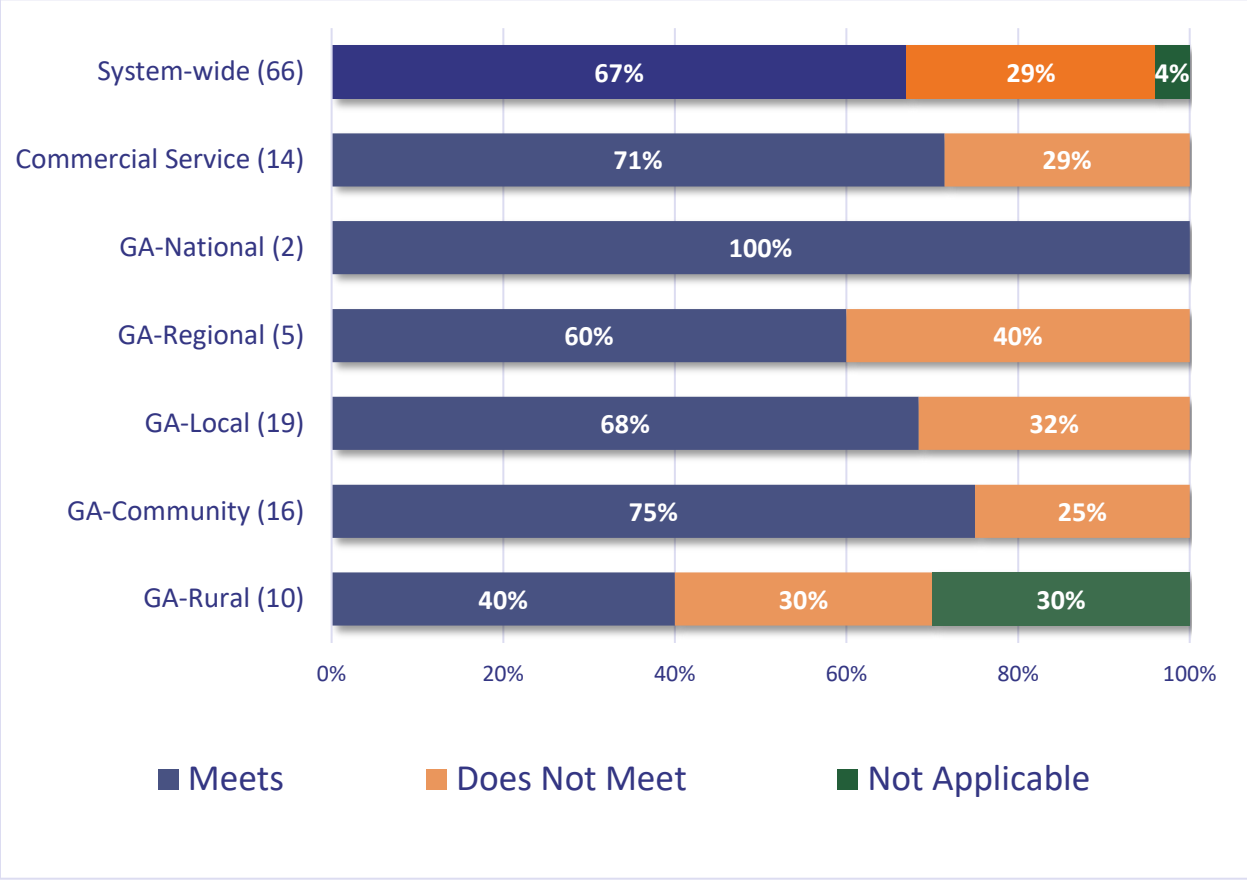


Source: 2018 Inventory & Data Form

6.6.1.6. Runway Markings

Runway marking objectives were chosen in association with the approach type. Precision runway markings should be present at Commercial Service and GA-National airports. Non-precision runway markings are the objective for GA-Regional, GA-Local, and GA-Community airports, while the GA-Rural objective is for basic runway markings. **Figure 6.55** summarizes runway marking objective performance by airport classification. Overall, 67 percent of system airports meet their respective runway markings objective. Sixty percent of GA-Regional airports meet their objective. Three GA-Rural airports have unpaved runways and therefore are not applicable to the analysis. All GA-National airports are meeting their runway markings objective. Commercial Service and GA-Community airports are meeting this objective at 71 percent and 75 percent, respectively. It should be noted that some airports may not meet the objective for runway markings because they don't have the approach type associated with the airport's classification.

Figure 6.55. Percent of Airports by Classification Meeting Runway Markings Objective



Source: 2018 Inventory & Data Form

6.6.2. Lighting/NAVAIDs Facility Objectives

The lighting and NAVAIDs facility objectives represent a selection of important assets an airport can acquire that improve the operational safety of their facility. The following airside lighting/NAVAIDs

were assessed for Colorado system airports, with specific objectives assigned for each airport's classification:

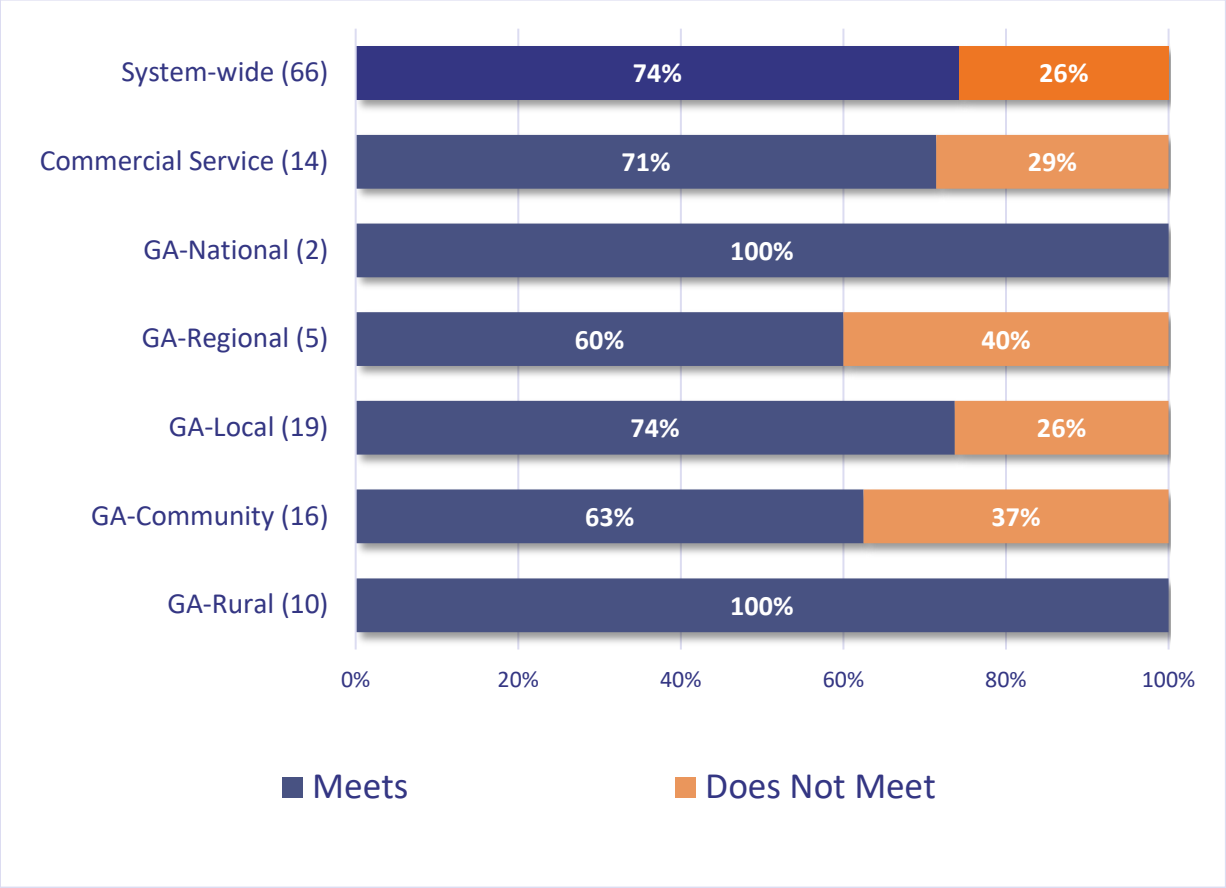
6.6.2.1 Primary Approach
6.6.2.2 Visual Aids
6.6.2.3 Primary Runway Lighting
6.6.2.4 Weather Reporting

6.6.2.1. Primary Approach

The primary approach objective distinguishes between airport classifications in terms of precision, non-precision with vertical guidance, and non-precision approach procedures. GA-Rural airports have the objective to maintain the existing approach type. A precision approach is the objective for Commercial Service and GA-National airports, while the objective for GA-Regional airports is to have a non-precision approach with vertical guidance. Both the GA-Local and GA-Community airport classifications have a non-precision approach objective.

Figure 6.56 summarizes primary approach objective performance across Colorado system airports. System-wide, 74 percent of CASP airports are meeting this objective, with 100 percent of GA-National and GA-Rural airports meeting their approach type objectives. Airports within the GA-Regional and GA-Community classifications are meeting their approach objectives at 60 percent and 63 percent respectively. Approximately 71 percent of Commercial Service and 74 percent of GA-Local airports are meeting their respective approach type objectives for the approach to their primary runway.

Figure 6.56. Percent of Airports by Classification Meeting Primary Approach Objective

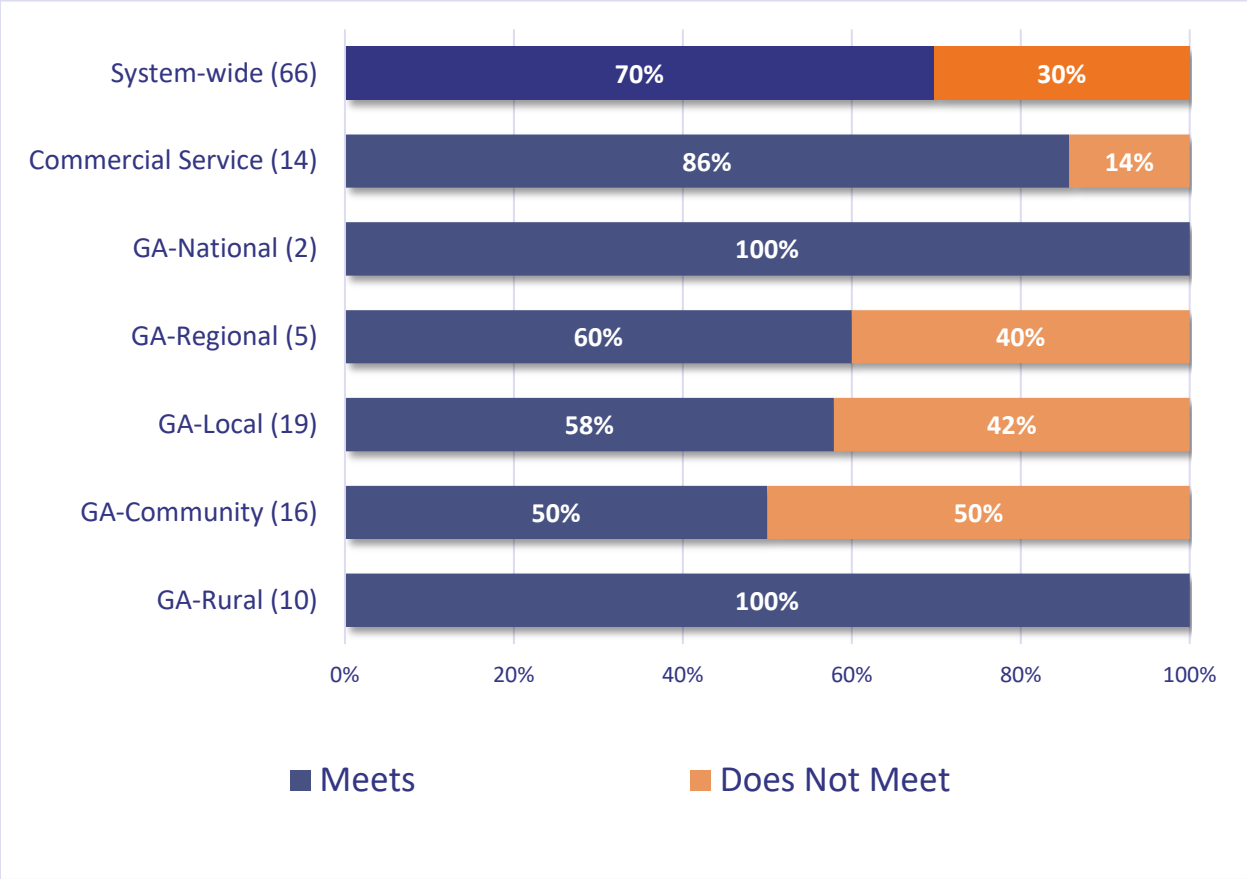


Source: 2018 Inventory & Data Form

6.6.2.2. Visual Aids

Figure 6.57 summarizes visual aid objective performance for CASP airports by airport classification. Seventy percent of airports in the Colorado system are meeting their respective objective, with GA-National and GA-Rural meeting their objectives at 100 percent. The airport classification with the lowest percentage of airports meeting the visual aids objective is the GA-Community classification, with 50 percent. Approximately 60 percent of GA-Regional airports, and 58 percent of GA-Local airports are meeting this objective, while 86 percent of Commercial Service airports are meeting their visual aids objective.

Figure 6.57. Percent of Airports by Classification Meeting Visual Aids Objective



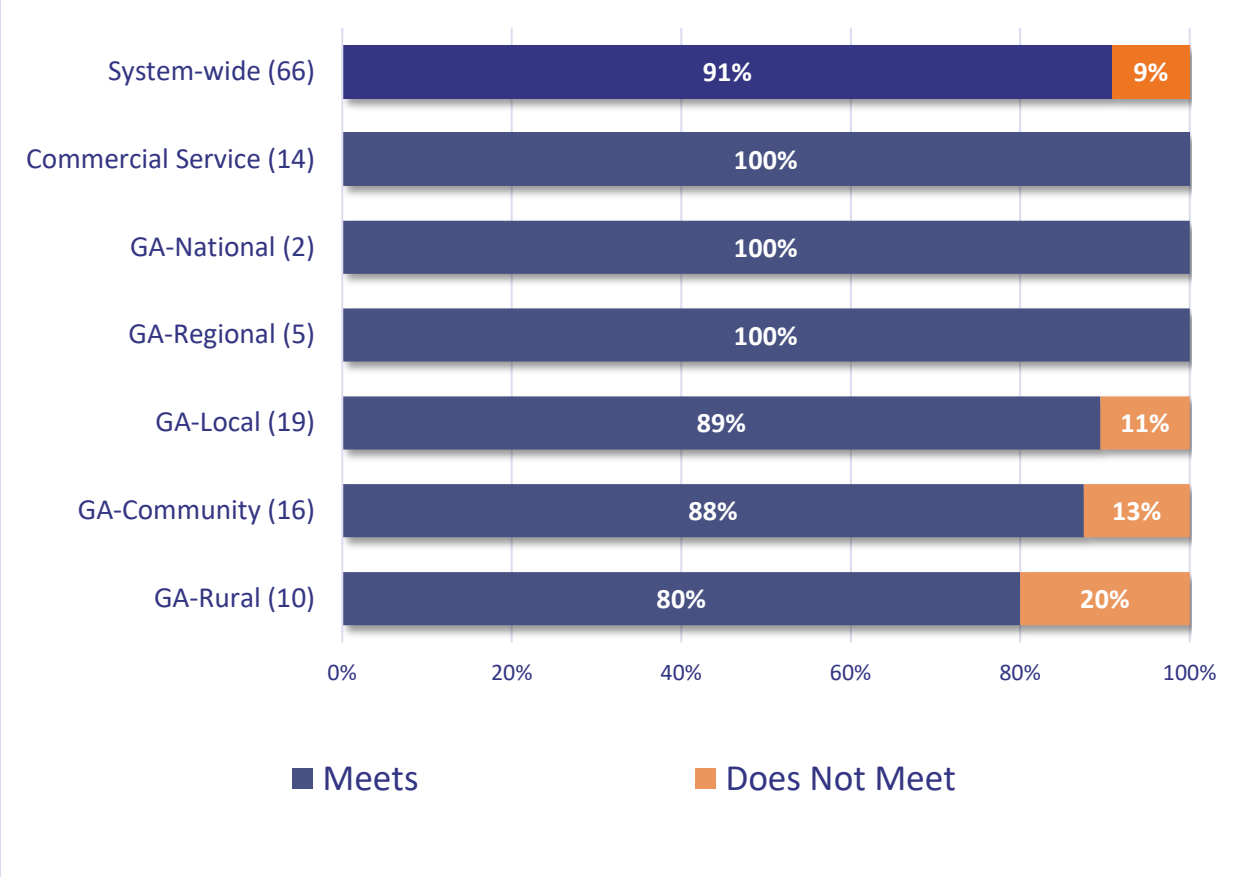
Source: 2018 Inventory & Data Form

6.6.2.3. Primary Runway Lighting

Runway lighting is necessary for night-time operations on the primary runway and is separated into three classifications based on brightness. The runway lighting objective recommended for Commercial Service and GA-National on their primary runway is to have high intensity runway lighting (HIRL) or medium intensity runway lighting (MIRL). GA-Regional, GA-Local, and GA-Community are recommended to have MIRL, while the GA-Rural airports need reflectors to meet their primary runway lighting objective. **Figure 6.58** summarizes primary runway lighting objective performance by CASP classification. Overall, the system has 91 percent of airports meeting their recommended primary runway lighting objective, with Commercial Service, GA-National, and GA-Regional having 100 percent

of their airports meeting this objective. Eighty-nine percent of GA-Local airports, and 80 percent of GA-Rural airports are meeting their runway lighting objective, with GA-Community at 88 percent.

Figure 6.58. Percent of Airports by Classification Meeting Primary Runway Lighting Objective



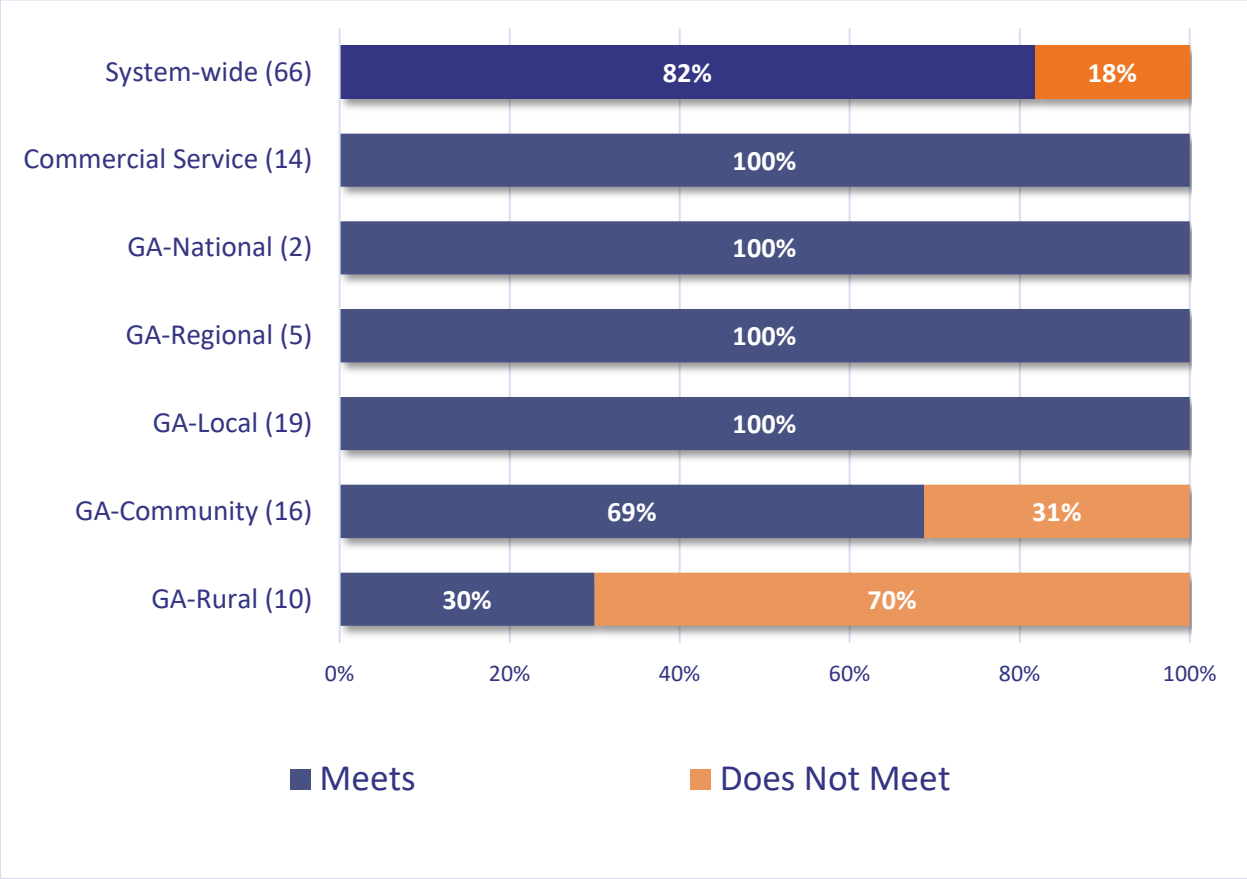
Source: 2018 Inventory & Data Form

6.6.2.4. Weather Reporting

The final visual aid component to be included as a CASP facility and service objective is the presence of weather reporting equipment. The objectives for Commercial Service, GA-National, and GA-Regional airports is to have an on-site ASOS or AWOS, while GA-Local and GA-Community airports should at least have an automated Unicom. GA-Rural airports are considered meeting the objective if they have at least a non-certified weather-reporting system.

Figure 6.59 summarizes the performance of the weather reporting objectives for all CASP airport classifications. Eighty-two percent of all CASP airports are meeting their respective weather reporting objective. All the CASP airport classifications, except for GA-Community and GA Rural airports, are meeting this objective at 100 percent. Sixty-nine percent of GA-Community airports and 30 percent of GA-Rural airports are meeting their weather reporting objective.

Figure 6.59. Percent of Airports by Classification Meeting Weather Reporting Objective



Source: 2018 Inventory & Data Form

6.6.3. Airport Facility Objectives

Airport facilities are important elements of an airport's attractiveness to users and can determine the usage and capacity of an airport. In addition, airport facilities can promote safety, including promoting security through fencing, and include facilities such as a Maintenance/SRE building that can support airport and aircraft maintenance needs. Also, of interest to many is the provision of storage facilities for aircraft and cars, especially electric vehicles as they continue to grow in popularity. This section looks more closely at the follow airport facilities present at Colorado system airports:

6.6.3.1 Terminal Capacity (Commercial Service and GA)
6.6.3.2 Apron Tie-Downs
6.6.3.3 Hangars
6.6.3.4 Maintenance/SRE Building
6.6.3.5 Electric Vehicle Charging Stations
6.6.3.6 Perimeter Security

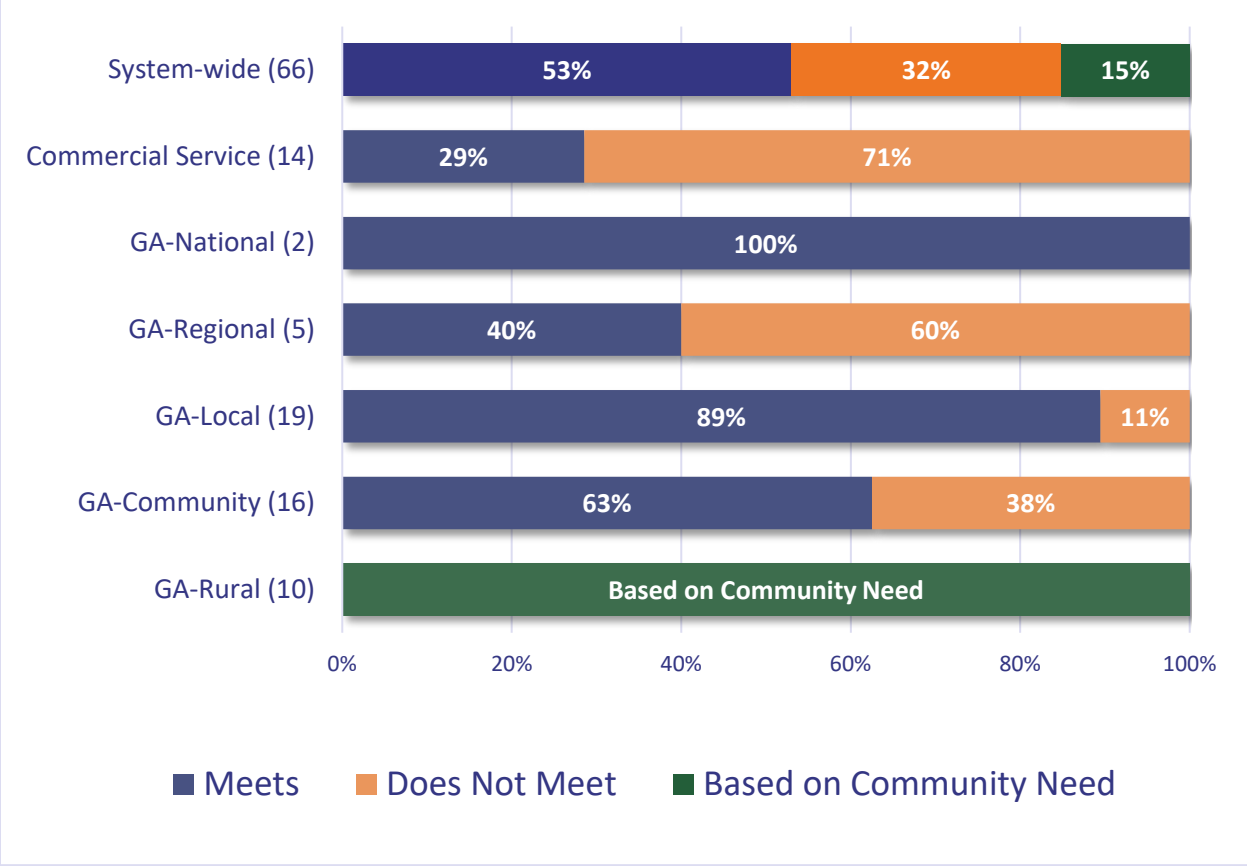
6.6.3.1. Terminal Capacity (Commercial Service and GA)

An airport's terminal capacity is a strong indicator of activity levels and can demonstrate if the airport is being under or over utilized. Since the activity levels and needs across airport classifications are so

different, the recommended terminal capacity levels are also varied. Earlier in this chapter, terminal capacities for commercial service airports were calculated using standards set by ACRP Report 25 to determine the minimum terminal square footage based on the number of gates present at the airport. Terminal capacities for GA airports used the methodology found in ACRP Report 113 to determine the acceptable ratio of 150 sq. ft. per peak hour number of passengers. An acceptable ratio of terminal square footage is not a part of the terminal capacity objective for GA-Regional, GA-Local, and GA-Community. Instead, the objective for these airport classifications focuses on terminal amenities such as: restrooms, flight planning space, Wi-Fi availability, and a rest area. Airports in these classifications can meet the terminal capacity objective if the airport has all of those terminal amenities. GA-Rural airports do not have a specific objective for their terminal capacity, but their development should coincide with community needs.

Figure 6.60 summarizes terminal capacity objective performance for all CASP airports. System-wide, 53 percent of airports are meeting their respective terminal capacity objective. Twenty-nine percent of Commercial Service, 100 percent of GA-National, and forty percent of GA-Regional airports are meeting this objective. GA-Local airports are meeting at 89 percent and GA-Community airports are in the middle of the range with 69 percent of airports meeting the terminal capacity objective. The objective for GA-Rural airports is based on community need.

Figure 6.60. Percent of Airports by Classification Meeting Terminal Capacity Objective

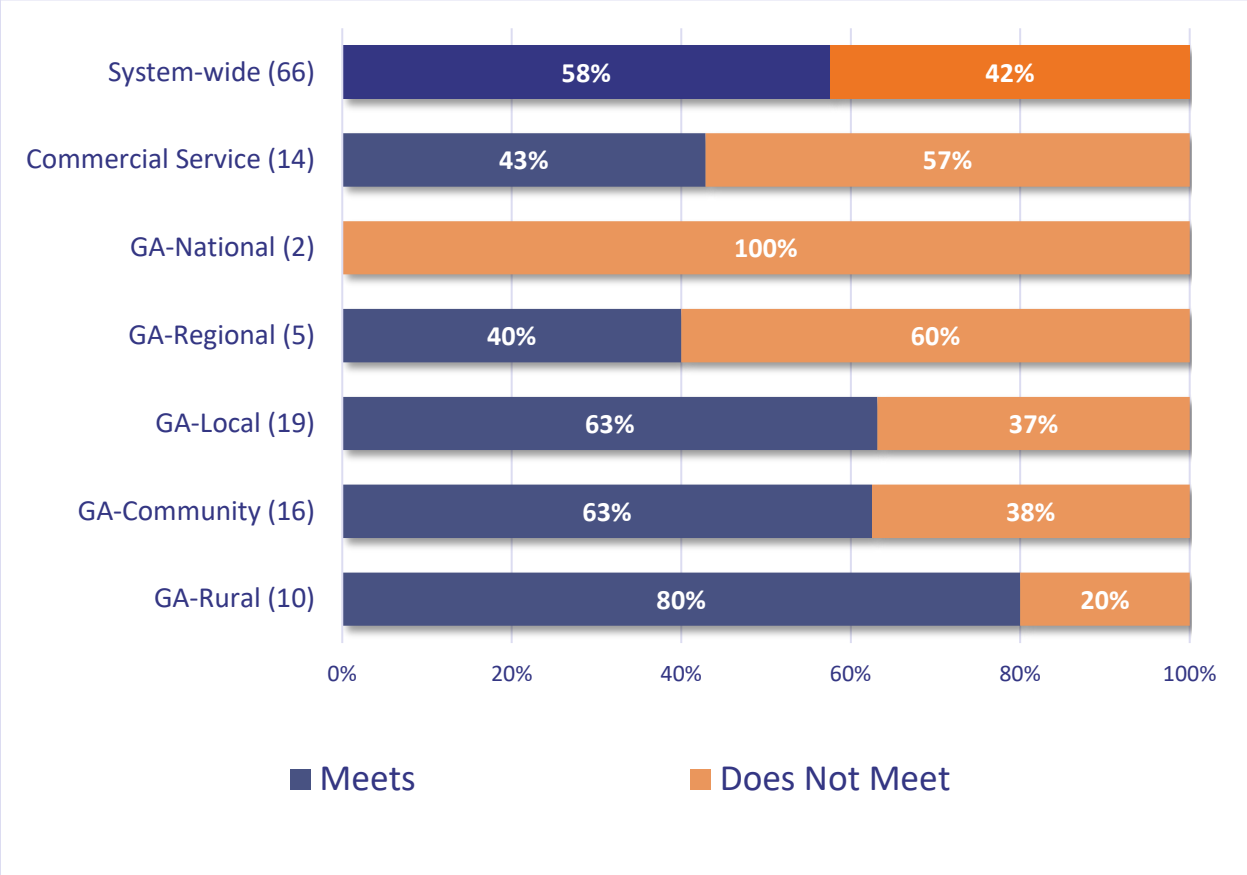


Sources: 2018 Inventory & Data Form; Individual Airport Master Plans; Google Earth; ACRP Report 25; ACRP Report 113, 2014

6.6.3.2. Apron Tie-Downs

Apron tie-down objectives for all airport classifications, excluding GA-Rural airports, are based on the number of tie-downs for a percentage of the airport's based aircraft fleet and a percentage of the weekly average overnight transient storage during peak season. GA-Rural airports meet their objective if they have tie-downs for 100 percent of their based aircraft fleet. The percentage considered for based aircraft and weekly transient overnight fleet changes based on classification. It is important to note that many airports provide more covered storage in the form of hangars due to aircraft owner preference, space, weather, or other factors. Other airports do not have the financial capability to provide as many hangars and rely on apron tie-downs for both based and transient aircraft. **Figure 6.61** summarizes apron tie-down objective performance across CASP airports. Overall, 58 percent of system airports are meeting their respective objective. Neither of the GA-National airports are meeting this objective as apron tie-downs are not their primary form of aircraft storage. Sixty-three percent of both GA-Local and GA-Community airports are meeting this objective, with 43 percent of Commercial Service airports meeting. Eighty percent of GA-Rural airports are meeting their apron tie-down objective.

Figure 6.61. Percent of Airports by Classification Meeting Apron Tie-Downs Objective



Source: 2018 Inventory & Data Form

6.6.3.3. Hangars

Hangars, like apron tie-downs, are an essential part of any airport's facilities. It is important that airports can provide adequate facilities for parking and storing aircraft, for both based and transient fleets. The amount of covered storage or parking needed at each airport can depend on several factors, including airport activities, the volume of operations, climate, and an operator's desire for security.

The objectives for hangar space are written similarly to the apron-tie down objectives, as it considers both based aircraft and the weekly overnight transient fleet. Commercial Service airports were measured using 80 percent of their based aircraft fleet, while GA-National and GA-Regional airports were measured using 60 percent of based aircraft fleet. GA-Local and GA-Community airports were measured using 50 percent and 40 percent of based aircraft and transient fleet, respectively. The 2018 Inventory & Data Form asked airports to provide the number of weekly transient overnight aircraft at their facility, and a percentage of that number was used to analyze the transient aircraft component of the hangar objective. Fifty percent of weekly transient overnight aircraft was used for Commercial Service, GA-National, and GA-Regional airports, while 25 percent was used for GA-Local airports. The objective for GA-Community and GA-Rural airports are to provide hangars at their facilities based on community need. A summary of these percentage breakdowns used to analyze adequate hangar space for based and transient aircraft by airport classification is shown below in **Table 6.9**.

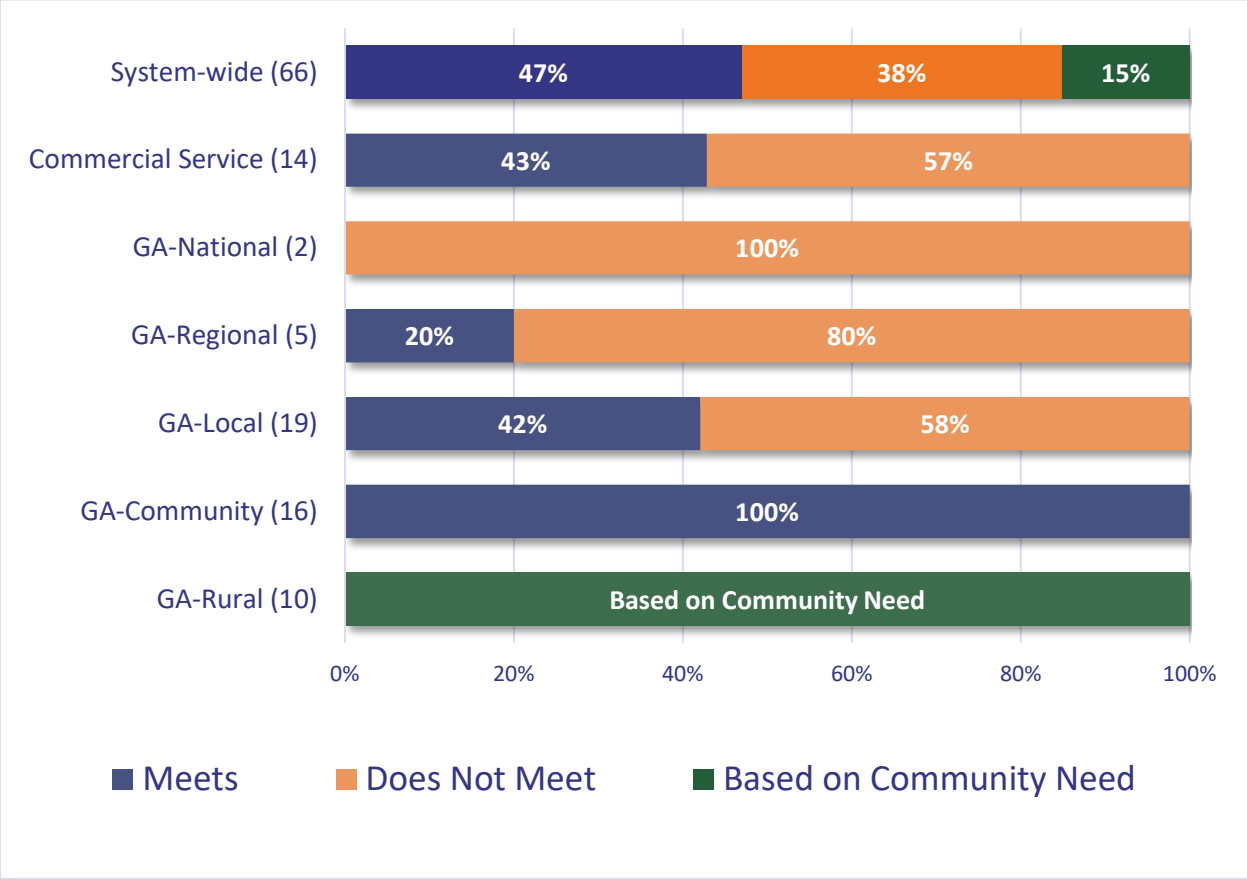
Table 6.9. Summary of Percentages Used to Measure Hangar Space by Airport Classification

Airport Classification	Percentage of Based Aircraft Used to Measure Hangar Objective	Percentage of Transient Aircraft Used to Measure Hangar Objective
Commercial Service	80%	50%
GA-National	60%	50%
GA-Regional	60%	50%
GA-Local	50%	25%
GA-Community	40%	Based on community need
GA-Rural	Based on community need	Based on community need

Source: 2020 CASP Facility and Service Objectives

Figure 6.62 summarizes the percentage of airports by classification meeting the hangar objectives. Forty-seven percent of airports system-wide are meeting their respective hangar objectives. Commercial Service, GA-Regional, and GA-Local have between 20 and 43 percent of their airports meeting this objective. One hundred percent of GA-Community airports are meeting their hangar objectives. Neither of the GA-National airports reported having adequate hangar space for based and transient aircraft, resulting in 100 percent of GA-National airports not meeting this objective. Hangar objectives for GA-Rural airports is based on community need.

Figure 6.62. Percent of Airports by Classification Meeting Hangar Objective



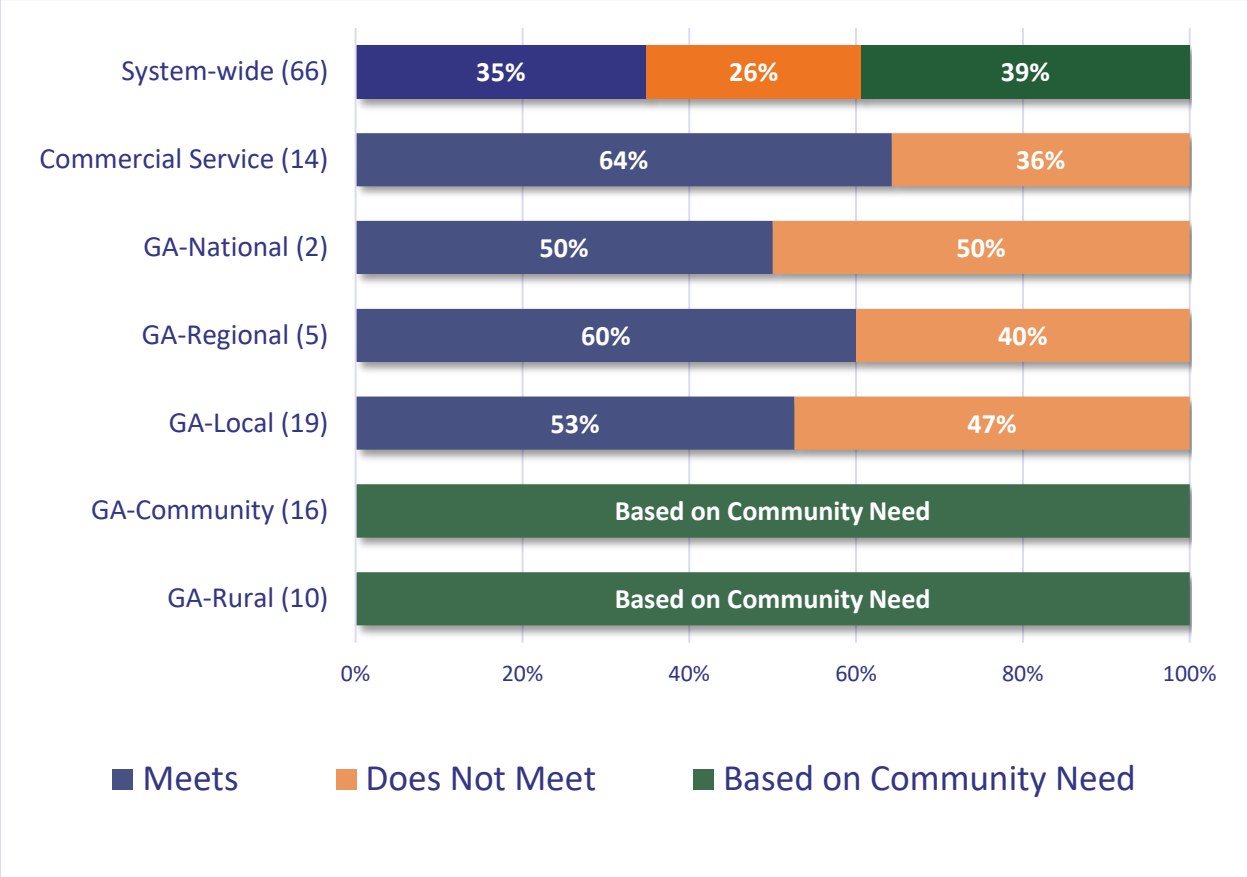
Source: 2018 Inventory & Data Form

6.6.3.4. Maintenance/Snow Removal Equipment (SRE) Storage Building

Maintenance and/or snow removal equipment (SRE) storage buildings are a crucial asset for many Colorado airports, especially during the challenging winter season. It is recommended that a maintenance/SRE storage building, whether standalone or combined in a single facility, be present at all Commercial Service, GA-National, GA-Regional, and GA-Local airports. GA-Community and GA-Rural airports are recommended to have a maintenance/SRE storage building at their facility based on community need.

Figure 6.63 summarizes maintenance/SRE storage building objective performance for all CASP airports by classification. System-wide 35 percent of airports are meeting the maintenance/SRE storage building objective for their classification. Sixty-four percent of Commercial Service airports are meeting the objective. Approximately 50 percent of airports in both GA-National and GA-Local classifications are meeting this objective, with 60 percent of GA-Regional airports meeting. All GA-Community and GA-Rural airports objectives are based on community need.

Figure 6.63. Percent of Airports by Classification Meeting Maintenance/SRE Storage Building Objective

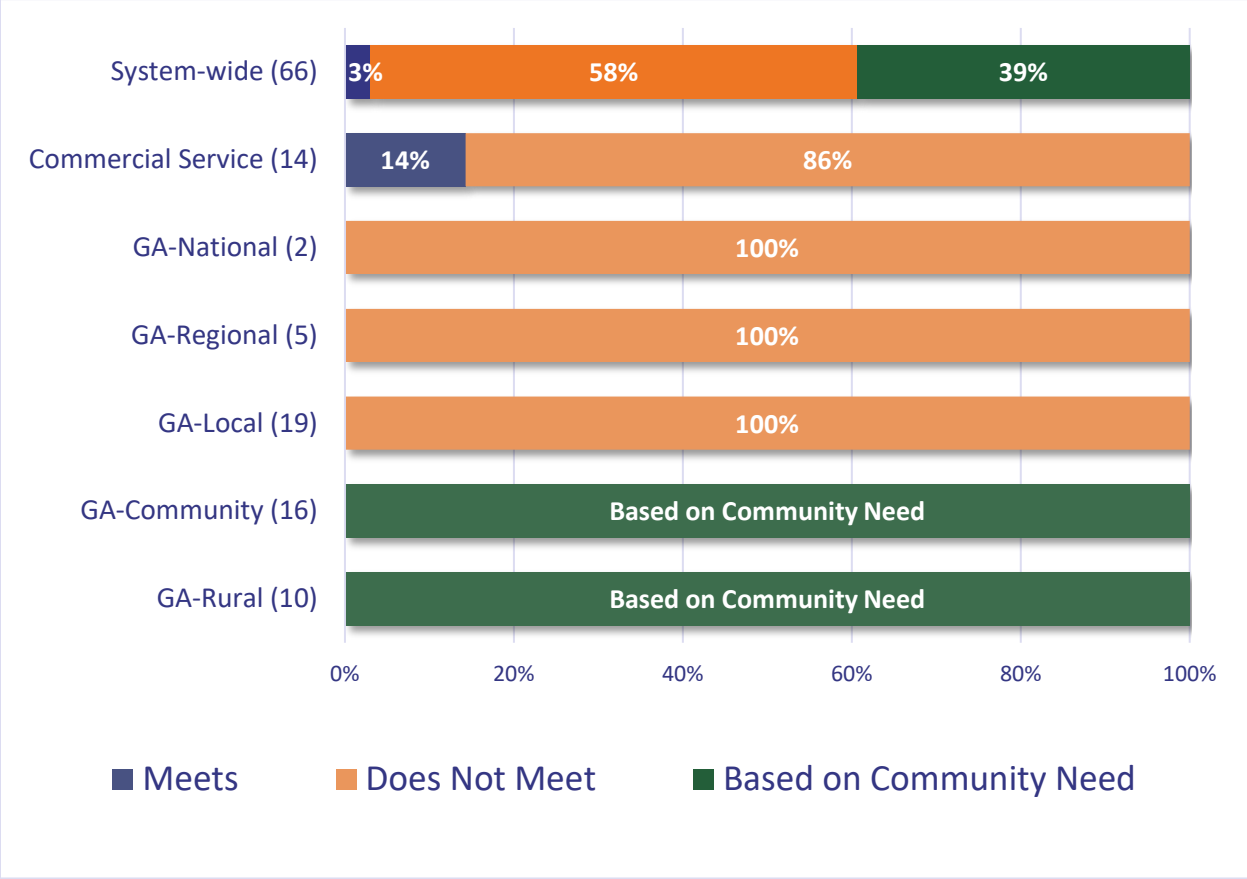


Source: 2018 Inventory & Data Form

6.6.3.5. Electric Vehicle Charging Stations

As electric vehicle proliferation continues, and personal electric vehicle ownership rises, it will be important for airports to accommodate these changes. For that reason, the CASP objectives for Commercial Service, GA-National, GA-Regional and GA-Local airports are to have electric vehicle charging stations. Electric vehicle charging stations objectives for GA-Community and GA-Rural airports are based on community need. Since personal electric vehicle usage is an emerging transportation solution, there are many airports within the system that have not caught up to the growing trend. It should be noted airports are considered to meet the objective if they have at least one existing electric vehicle charging station. **Figure 6.64** summarizes electric vehicle charging station objective performance across airport classifications. Of the airports whose objectives were to provide these facilities, only 14 percent of commercial airports report having electric vehicle charging stations. These make up the three percent of airports system-wide that meet the objective.

Figure 6.64. Percent of Airports by Classification Meeting Electric Vehicle Charging Station Objective

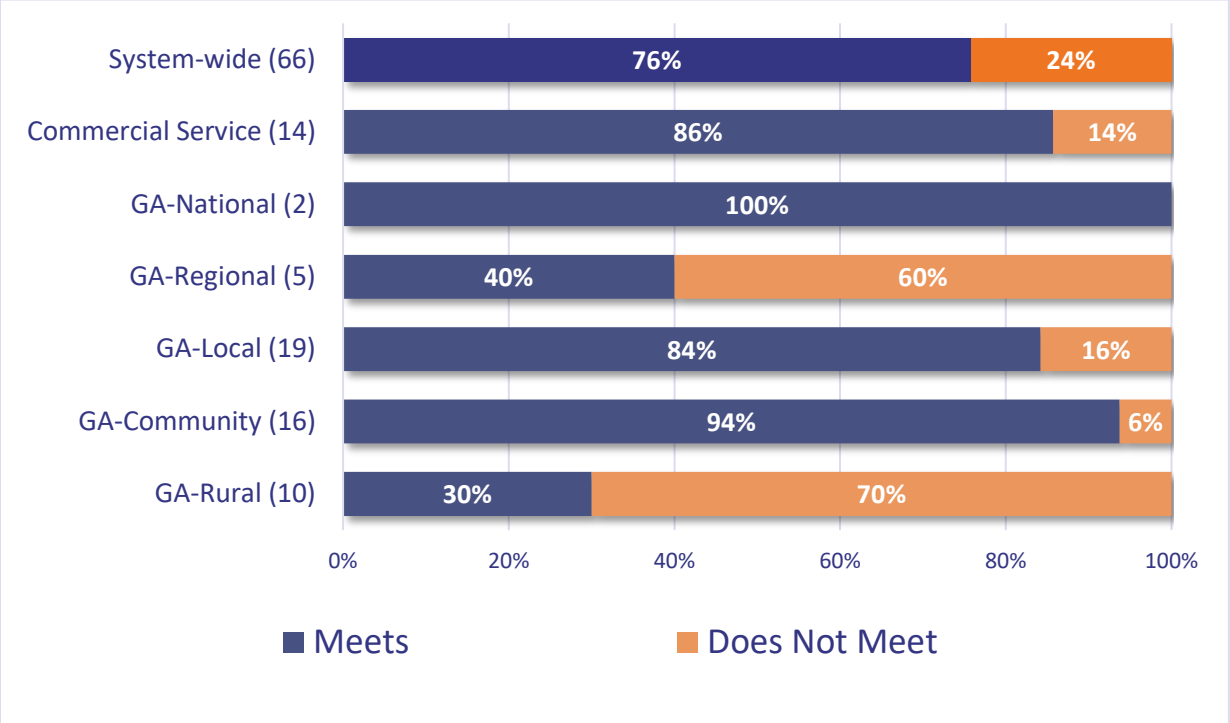


Source: 2018 Inventory & Data Form

6.6.3.6. Perimeter Security

Perimeter security needs vary across CASP airport classifications. It is recommended that full perimeter fencing with security gates and appropriate signage exist at all Commercial Service, GA-National, and GA-Regional airports. Airports within the GA-Local, GA-Community, and GA-Rural classifications are recommended to have 3-wire fencing with appropriate signage around the aircraft operating area (AOA). **Figure 6.65** summarizes perimeter security objective performance for CASP airports. Across Colorado system airports, 76 percent of airports meet their perimeter security objective. Commercial Service and GA-Community airports have 86 and 94 percent of airports meeting this objective, respectively. Eighty-four percent of GA-Local and 100 percent of GA-National airports are meeting this objective. Thirty percent of GA-Rural airports have adequate fencing at their facility and 40 percent of GA-Regional airports meet this objective.

Figure 6.65. Percent of Airports by Classification Meeting Perimeter Security Objective



Source: 2018 Inventory & Data Form

6.6.4. Service/Other Objectives

Airports can have a variety of other amenities or services available to users that improve the quality of the pilot and passenger experience. These other services promote airport activity and attract more users by offering fuel access, courtesy cars, and other amenities. CASP airports are assessed on the following service objectives:

6.6.4.1 Jet A Fuel
6.6.4.2 AvGas Fuel
6.6.4.3 Aircraft De-icing
6.6.4.4 Courtesy Car
6.6.4.5 Sustainability Plan

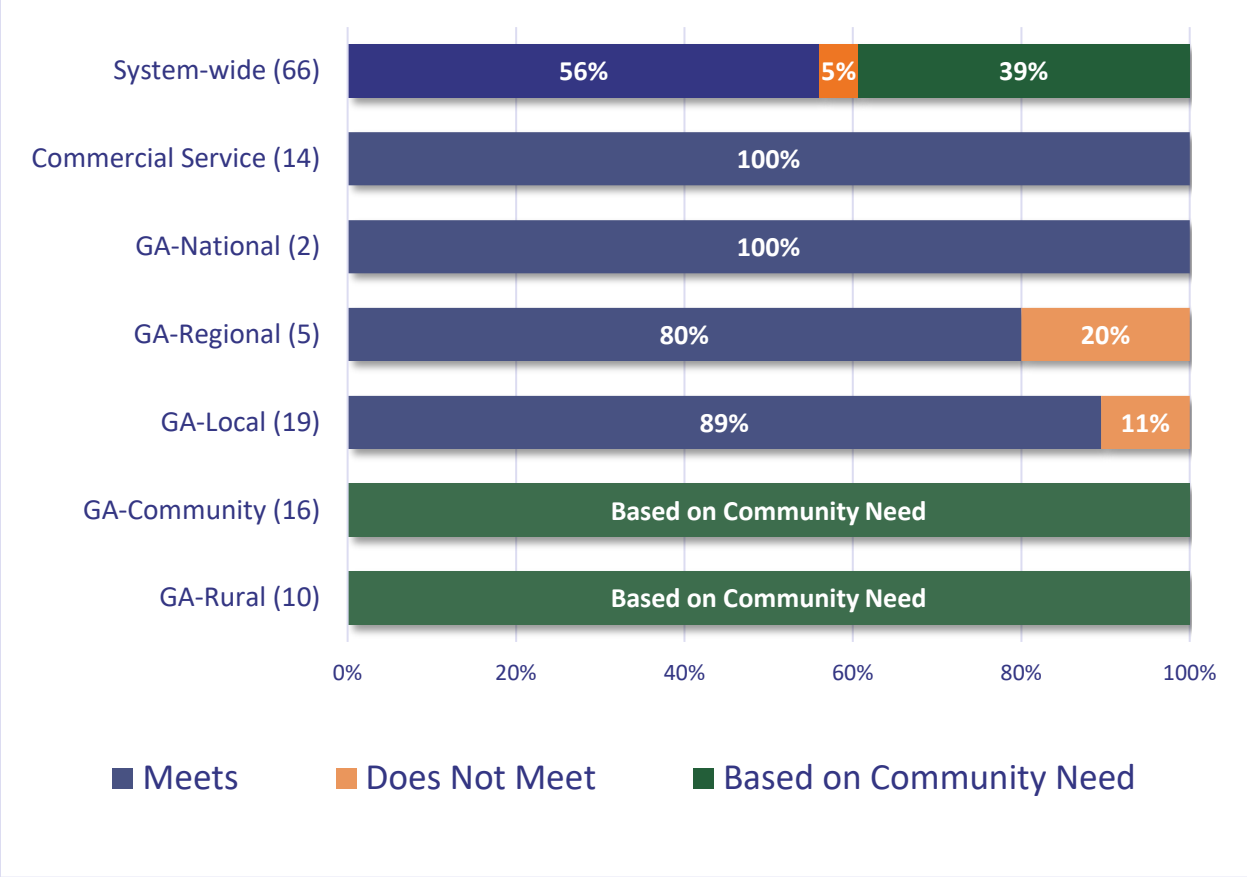
6.6.4.1. Jet A Fuel

Jet A fuel availability is an important service to have at any airport that has frequent jet aircraft activity. For this reason, it is an objective for all Commercial Service, GA-National, and GA-Regional airports to have full Jet A fuel services, with 24/7 (self-serve or call out) service for GA-Local airports. GA-Community and GA-Rural airports are only recommended to have Jet A fuel services based on community need. GA Community and GA-Rural airports' objectives are based on community needs.

Figure 6.66 summarizes Jet A fuel objective performance for CASP airports. System wide, 95 percent of all airports are meeting their respective Jet A fuel service objective. All Commercial Service and GA-National airports meet the objectives, while 80 percent and 89 percent of GA-Regional and GA-Local

airports, respectively, are meeting the objective. GA-Community and GA-Rural airports' objectives are based on community needs.

Figure 6.66. Percent of Airports by Classification Meeting Jet A Fuel Objective

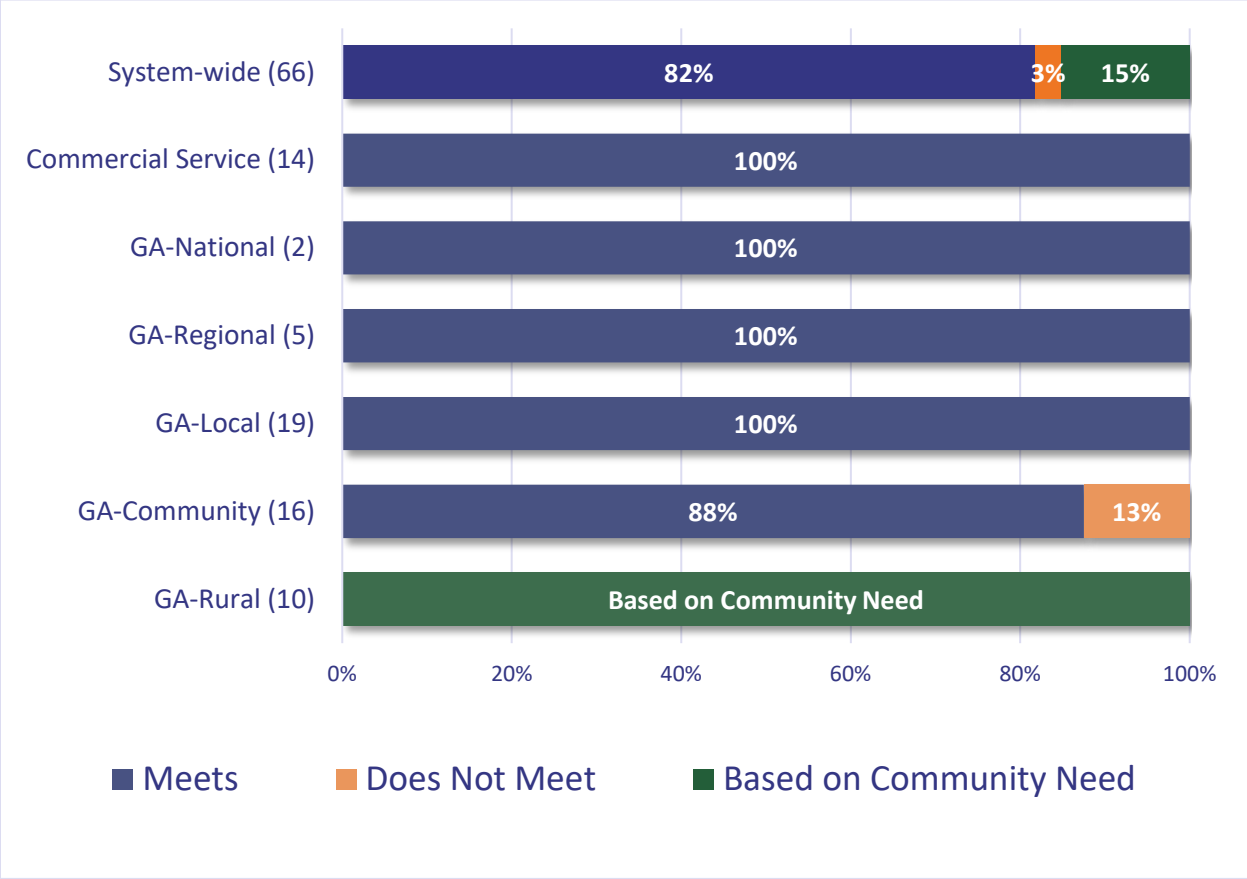


Sources: 2018 Inventory & Data Form; FAA 5010 Master Record, 2019

6.6.4.2. AvGas Fuel

It is important that many Colorado system airports can provide both AvGas and Jet A fuel to attract a broader range of users. Therefore, it is an objective that Commercial Service, GA-National, and GA-Regional airports have full AvGas services, while GA-Local and GA-Community airports provide 24/7 (self-serve or call out) AvGas services. GA-Rural airports are recommended to have AvGas services based on community need. **Figure 6.67** summarizes AvGas fuel objective performance across CASP airport classifications. Overall, the system performs very well on this objective with 98 percent of all airports meeting their respective AvGas fuel objective. In fact, all the airport classifications are meeting this objective except for one airport belonging to the GA-Community classification.

Figure 6.67. Percent of Airports by Classification Meeting AvGas Fuel Objective

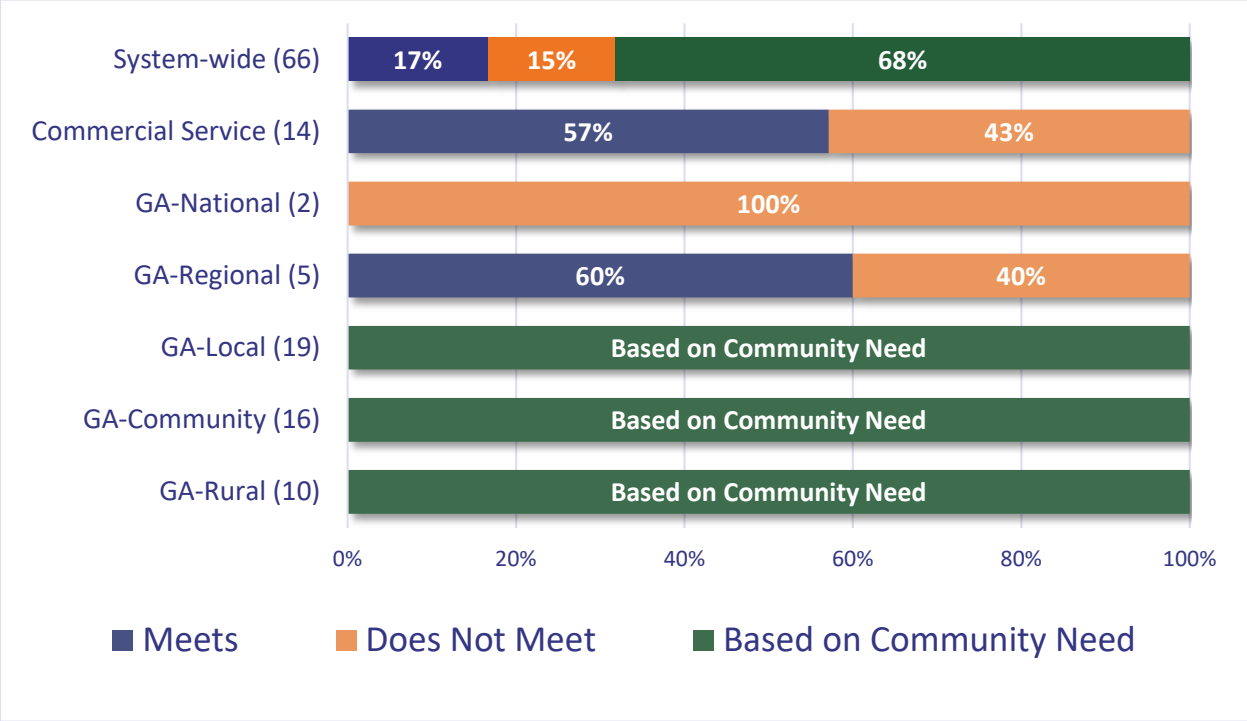


Sources: 2018 Inventory & Data Form; FAA 5010 Master Record, 2019

6.6.4.3. Aircraft De-icing

Many areas in Colorado experience harsh winters, and some airports are more affected by these icy conditions than others due to elevation and other factors. Icy conditions can cause a variety of issues for airports from service delays to unsafe operations. Therefore, it was determined that de-icing facilities would be incorporated as a service objective for CASP airports. The objective varies amongst the classifications, with de-icing facilities including fluid collection recommended at Commercial Service and GA-National airports and a dedicated de-icing area recommended for GA-Regional airports. De-icing facilities are based on community need for GA-Local, GA-Community, and GA-Rural airports. **Figure 6.68** summarizes aircraft de-icing objective performance for CASP airports. Eighty-three percent of CASP airports are meeting their respective aircraft de-icing objectives. More than half (57 percent) of Commercial Service airports and 60 percent of GA-Regional airports meet their respective aircraft de-icing objectives. Both GA-National airports did not meet the objective resulting in 100 percent not meeting. GA-Local, GA-Community, and GA-Rural airports objectives are based on community need.

Figure 6.68. Percent of Airports by Classification Meeting Aircraft De-icing Objective



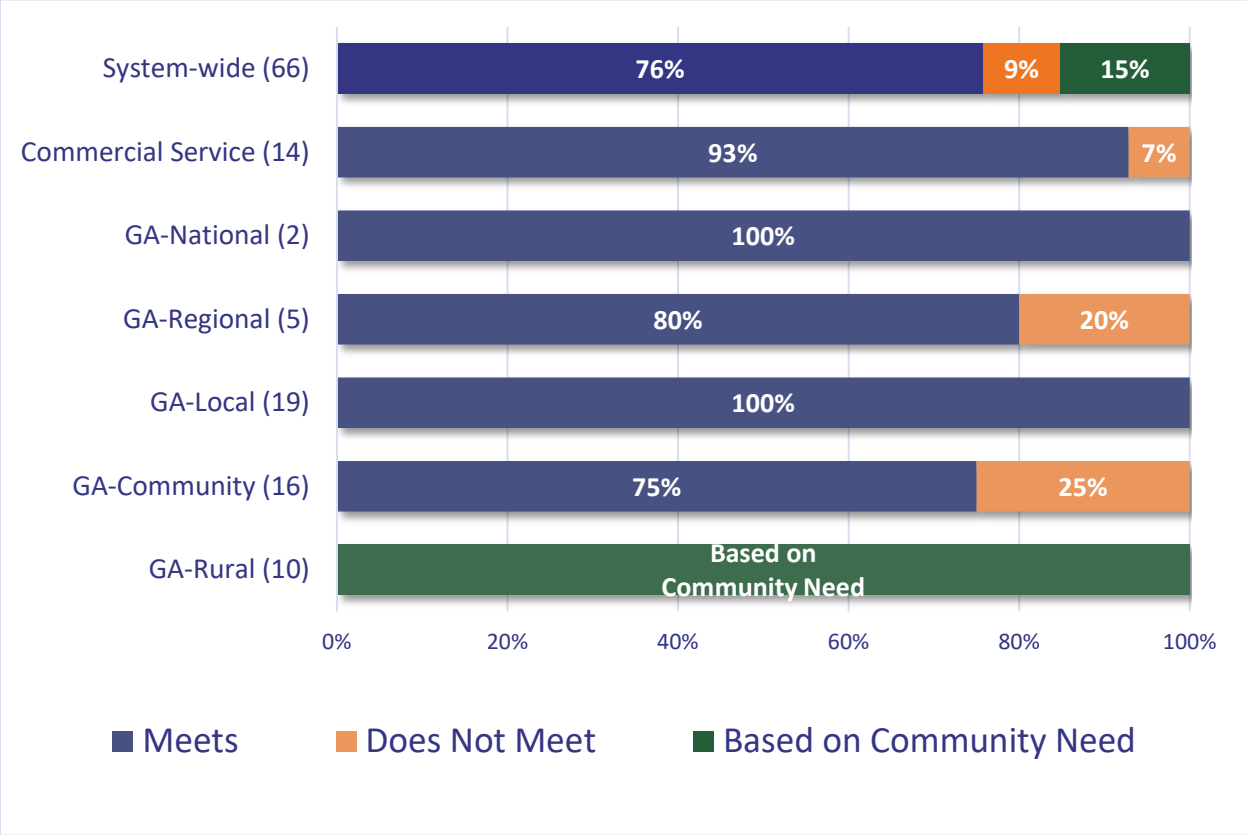
Source: 2018 Inventory & Data Form

6.6.4.4. Courtesy Car

Having adequate ground transportation at CASP airports is an important component to the overall system. Ground transportation can come in a variety of different forms, and also varies greatly between airport classifications. For this reason, the courtesy car was selected as the objective to measure ground transportation as a courtesy car is often the minimum that an airport will have. A courtesy car is a vehicle usually owned by the airport sponsor or FBO and is typically provided to pilots at no cost on a first-come, first-serve basis. In exchange for courtesy car use, users are often asked to put fuel in the vehicle, and/or leave a donation to support the vehicle's maintenance. **Section 6.3.2.1** airports were measured under the system indicator determining the percentage of airports that provide ground transportation, which included courtesy car or other form of ground transportation. Often the most rural or isolated airports in any given state will at least have a courtesy car on site for pilots or airport users to utilize to access the town or city associated with the airport.

Figure 6.69 summarizes courtesy car objective performance for all airport classifications in the CASP. Seventy-six percent of airports are meeting the courtesy car objective for their classification, with 100 percent of GA-National and GA-Local airports meeting the objective. Commercial Service airports are meeting this objective at 93 percent, while GA-Regional and GA-Community airports are meeting at 80 percent and 75 percent, respectively. The objective for GA-Rural airports is based on community need.

Figure 6.69. Percent of Airports Meeting Courtesy Car Objective



Source: 2018 Inventory & Data Form

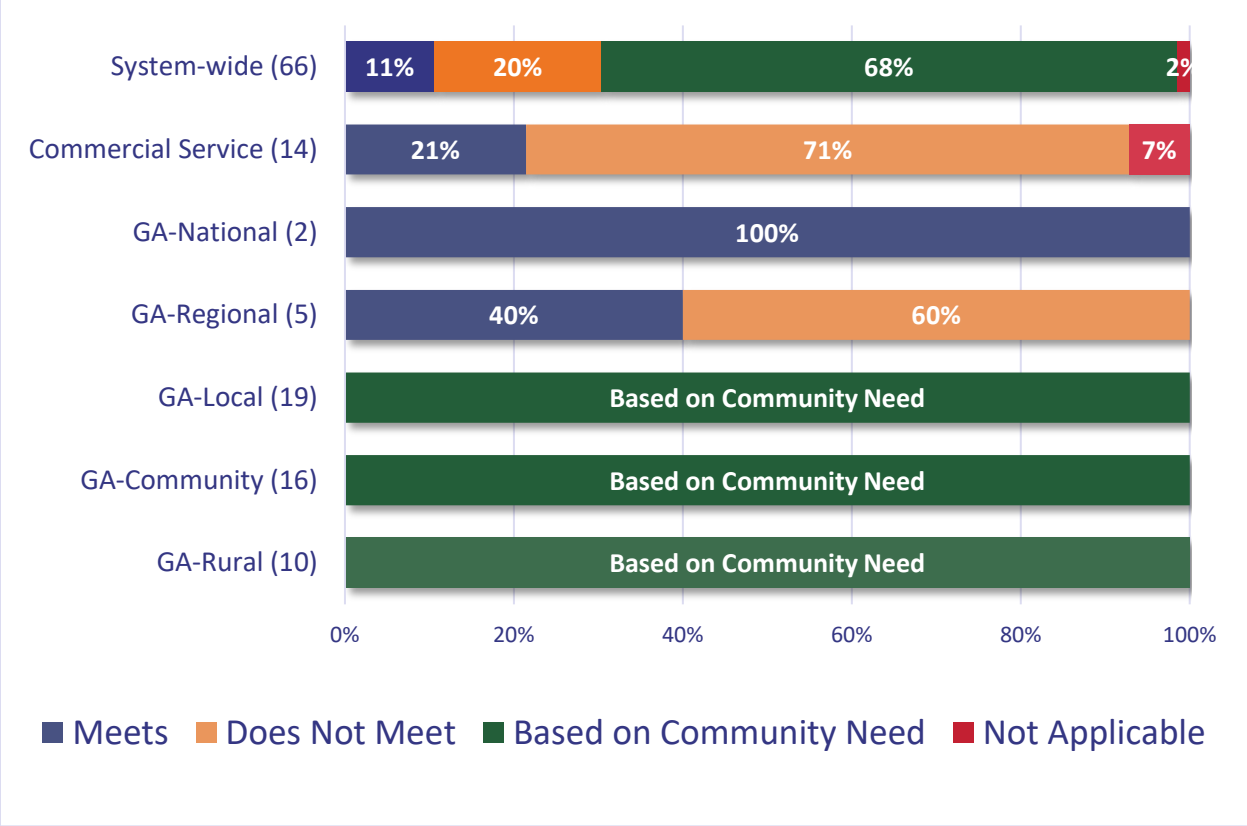
6.6.4.5. Sustainability Plan

Airports can participate in a variety of elective planning initiatives and efforts as previously discussed in **Section 6.5.2.2**, and airports were measured with a system indicator related to sustainability planning under the System Viability goal. In the past decade, sustainability efforts and planning has become popular across multiple disciplines, including aviation. CDOT has created the Colorado Airport Sustainability Program which provide airports a free online toolkit to prepare their own sustainability plan. The program allows airports to create and implement their own customizable sustainability plan including a financial component that may provide helpful measurement tools, goal setting, and resources to improve financial sustainability. The objective for Commercial Service, GA-National, and GA-Regional airports is for all have a sustainability plan, GA-Local, GA-Community, and GA-Rural airports are based on community need.

Figure 6.70 summarizes sustainability plan objective performance for CASP airports. System-wide, 11 percent of all airports meeting the sustainability plan objective. One of the Commercial Service airports did not provide data on whether or not they have a sustainability plan, which resulted in seven percent of Commercial Service airports, and two percent of airports overall, receiving a "not applicable" outcome. Lastly, Commercial Service and GA-Regional have 21 percent and 40 percent of airports meeting this objective, respectively. These results differ from the system indicator on

sustainability plans in **Section 6.5.2.2** because the objective for all GA-Local, GA-Community, and GA-Rural airports is designated as based on community need.

Figure 6.70. Percent of Airports by Classification Meeting Sustainability Plan Objective



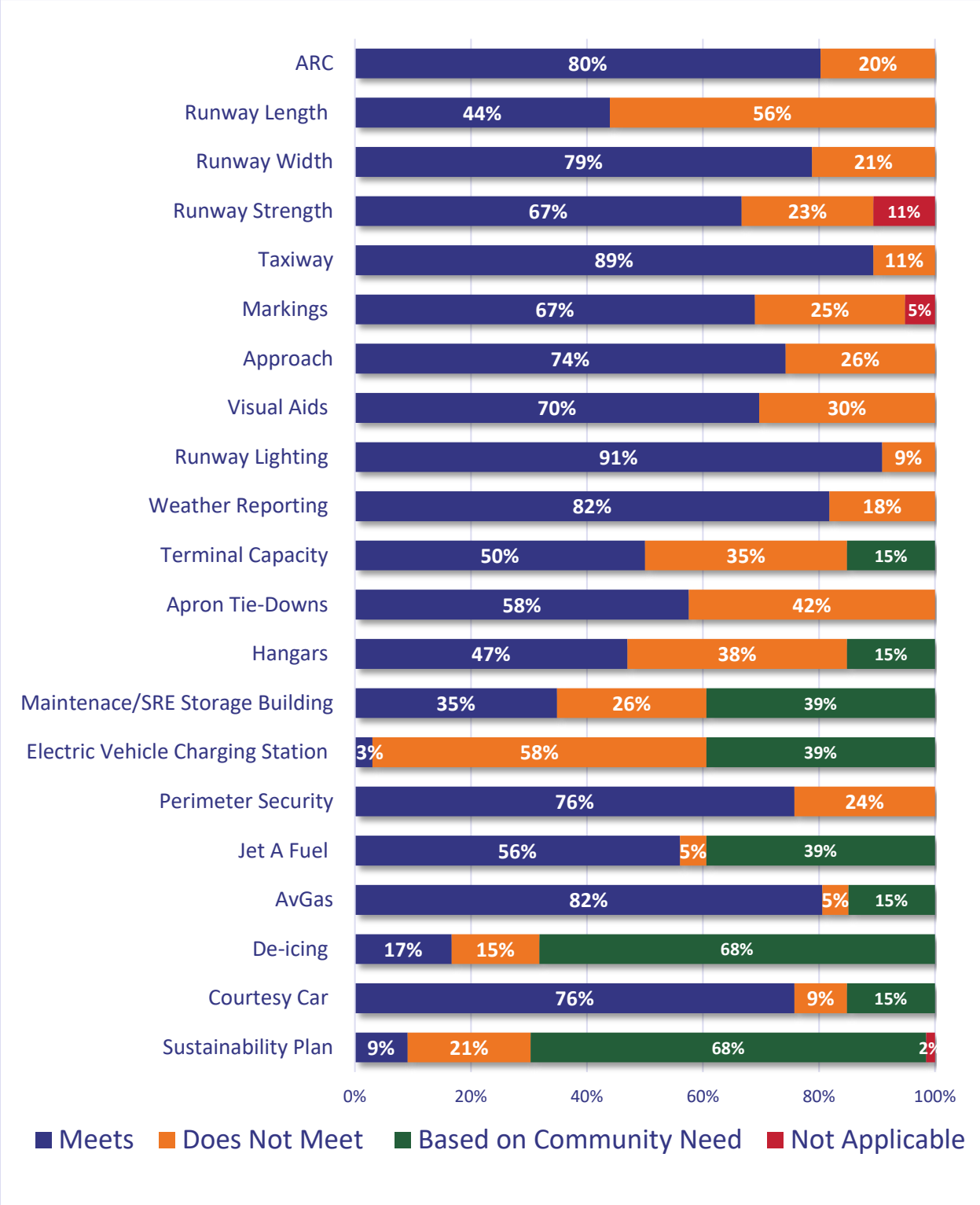
Source: 2018 Inventory & Data Form

6.6.5. Summary of Facility and Service Objectives

Section 6.6 and its associated subsections represent a comprehensive view of facility and service objectives performance for each CASP airport classification, and system-wide. It is difficult to compare objectives between classifications since each airport classification has a uniquely designed objective that corresponds with an airport's activity. However, included in **Appendix B** are individual report cards for each individual CASP airport that reports on how the airport performed on each facility and service objective. These report cards can be used to see how one airport performed compared to another airport within its same classification.

To conclude this section, a summary has been provided in **Figure 6.71** that presents the system-wide performance for each facility and service objective. Eighty percent or more of all system airports met the following facility and service objectives: ARC, runway width, taxiway, runway lighting, weather reporting, and AvGas. The system performed below 50 percent for the following objectives: runway length, hangars, maintenance/SRE building, electric vehicle charging stations, de-icing, and sustainability plan. When looking at the system-wide figures, 11 of the 21 facility and service objectives are being met with 70 percent or greater achieving the objectives.

Figure 6.71. System-wide Percent of Airports Meeting CASP Facility and Service Objectives



Sources: 2018 Inventory & Data Form; ALPs; FAA 5010 Master Record; Kimley-Horn, 2019