CHAPTER 6: SYSTEM PERFORMANCE

Washington State Performance Objectives

The Washington State Airport Classification System not only assigns airports based on their function and role, but also sets performance objectives for each classification level and represent goals for Washington's air transportation system. The performance objectives are used to evaluate facilities, services, and other factors important to preserving the airport system. Assessing if individual airports meet their appropriate performance objectives helps to identify improvement needs. In some cases, an airport may exceed these objectives to satisfy a particular local need or FAA design standard. On the other hand, there may also be instances in the system where an airport is unable to meet all of its objectives.

Exhibit 6-1 summarizes the performance objectives for Washington State public use airports and indicates their applicability to the various state classifications. Two types of performance objectives are proposed: 1) those that relate to all classifications, and 2) those that are customized for the facilities and services appropriate to each classification.

Exhibit 6-1: Performance Objectives and Their Applicability to Airport Classifications

	Objective	Commercial Service	Regional Service	Community Service	Local Service	Rural Essential	Seaplane Base
Operational Factors	Standard runway safety area	X	X	X	X	X	NA
	Runway PCI 75	X	X	X	X	X	NA
	Taxiway PCI 70	X	X	X	X	X	NA
	Apron PCI 70	X	X	X	X	X	NA
	No obstacles in threshold siting surface	X	X	X	X	X	X
	No obstacles in obstacle free zone	X	X	X	X	X	X
Plan	Planning documents less than 7 years old	X	X	X	X	X	X
Land Use Compatibility Protection	Compatibility policies in comprehensive plan	X	X	X	X	X	X
	Appropriate zoning designation for airport	X	X	X	X	X	X
	Land use controlled in runway protection zones	X	X	X	X	X	X
	Height hazard zoning or regulations	X	X	X	X	X	X
	Zoning discourages incompatible development	X	X	X	X	X	X
Facilities	Runway Length	5,000 feet	5,000 feet	3,200 feet	2,400 feet	No objective	No objective
	Taxiway	Parallel	Parallel	Parallel	Turn-around	Turn-around	No objective
	Instrument Approach	Lower than ¾ mile visibility minimum	Lower than ¾ mile visibility minimum	1 mile visibility minimum	No objective	No objective	No objective
	Lighting	Medium intensity	Medium intensity	Medium intensity	Low intensity	Reflectors	NA
	Visual Glide Slope Indicators	X	X	X	X	No objective	NA
	Weather Reporting	AWOS or ASOS	AWOS or ASOS	Super-Unicom	No objective	No objective	No objective
	Dock Facility	NA	NA	NA	NA	NA	Yes
Services	Fuel Sales	Jet A and 100LL	Jet A and 100LL	100LL	No objective	No objective	No objective
	Maintenance Service	Major	Major	Minor	No objective	No objective	No objective

Performance Objectives Applicable to All Classifications

Proposed performance objectives in the areas of operational factors, up-to-date plans and land use compatibility protection are applicable to all public use airports in the state. Further documentation on these performance objectives can be found in the Phase II Technical Report.

Operational Factors

All airports should provide an appropriate aircraft operating environment, measured by the following:

- Runway safety areas are in compliance with FAA standards. The purpose of a runway safety area is to minimize injuries and damage and to facilitate recovery if an aircraft overshoots or undershoots the runway. A runway safety area is solid and smoothly graded ground around a runway; its required width and length depend mostly on the size and speed of the aircraft using the runway.
- Airfield pavements are in good or excellent condition, measured by the following minimum Pavement Condition Indices (PCI):
    - 75 for runways.
    - 70 for taxiways and aprons.
- A PCI rating of 100 represents brand new pavement in perfect condition, while a rating of 0 represents a completely failed pavement. Keeping pavements in good condition is important for aviation safety and for minimizing the life cycle cost of the pavements.
- No obstacles are in the runway threshold siting surfaces or obstacle free zones (OFZ). These are imaginary surfaces around runways that must be kept clear of objects to avoid hazards to aviation. Information about these surfaces is not available for most of the airports in Washington, so they were not measured. WSDOT will launch a pilot program in 2009 to survey obstructions, which will provide a means for measuring more airports for these surfaces.

Up-to-Date Plans

The objective for the Airport Layout Plan (ALP) and narrative airport plan (Master Plan or ALP Report) to be not more than seven years old applies to all airport classifications. Having an up-to-date plan equips airports with a strategy that allows them to adjust to changing conditions both on- and off-airport and to ensure the long-term viability of the airport. Seven

years is an interval for updating that matches Washington's Growth Management Act requirement for updating comprehensive plans. If there has been little change in socioeconomic conditions, physical development, or airport activity since the last publication of planning documents for the airport, a full update may not be warranted.

Land Use Compatibility Protection

The primary purpose of land use controls around an airport is to protect the airport environs from encroachment that could compromise the integrity of the airport operations, now or in the future. In Washington, state law requires towns, cities, and counties to discourage development of incompatible land uses adjacent to public-use airports through adoption of comprehensive plan policies and development regulations. Under Washington's Growth Management Act communities are also required to recognize public use airports as essential public facilities.

All public use airports in the state should ensure that towns, cities and counties adopt policies and regulations to meet the following goal and its underlying objectives.

Comprehensive plan policies and development regulations aid in ensuring compatible land use adjacent to the airport, determined by meeting the following:

- Compatible land use policies are in the comprehensive plan.
- Airport zoning designation is appropriate (*i.e.*, Airport, Industrial, or Public Use).
- Runway protection zones (RPZ) are on airport property, or have been protected by appropriate zoning regulations.
- Zoning is in place to regulate airspace hazards or regulations prohibit penetrations of FAR Part 77 surfaces.
- Zoning (development) regulations are in place to discourage incompatible development surrounding the airport traffic pattern and approach/departure paths of the airport.

Performance Objectives Appropriate By Classification

Performance objectives related to airport facilities and services are tailored to the various airport classifications.

Airport facility performance objectives address runway length, taxiway, instrument approach, lighting, Visual Glide Slope Indicators (VGSI), weather reporting, and other facilities. Airport service performance objectives address fuel sales and aircraft maintenance. Detailed documentation is available in the Phase II Technical Report. The following summary provides an overview of these performance objectives by airport classification.

- The Commercial Service and Regional Service Airports have the same facility and service objectives because of the similarity of baseline needs for commercial passenger jets and corporate jets. The runway length objective is as recommended for medium jets at standard conditions (59 degrees and sea level) by the National Business Aircraft Association. Taxiway, weather reporting, and runway lighting objectives are associated with the objective for a "precision" instrument approach (visibility minimums lower than ¾ mile).
- Performance objectives for Community Service Airports are focused on providing airports with the capability to accommodate medevac and air taxi operations, including potential operations in very light jets (VLJ). The runway length objective is the minimum required for an instrument approach without penalizing approach visibility minimums. Taxiway, weather reporting, and runway lighting objectives are associated with the objective for a "nonprecision" instrument approach (visibility minimums not lower than 1 mile).
- Local Service Airports have facility and service objectives geared towards small piston general aviation and visual operations. The runway length objective is adequate for 75 to 95 percent of the small aircraft fleet, depending on temperature and airport elevation.
- Rural Essential Airports and Seaplane Bases have no service objectives and few facility objectives, reflecting the lower level of facilities and services needed at these airports compared to the other classifications.

Facility Objectives

Airport facility performance objectives address runway length, taxiway, instrument approach, lighting, Visual Glide Slope Indicators (VGSI), weather reporting, and dock facilities.

Runway Length

The runway length performance objective is based on accommodating the type of aircraft and/or the instrument approach level that is appropriate for the airport role.

The runway length performance objective is based on accommodating the type of aircraft and/or the instrument approach level that is appropriate for the airport role. The runway length an aircraft needs depends on a combination of factors, including aircraft performance characteristics, operating weight, temperature, airport elevation, runway gradient, and runway surface condition. In addition, the FAA specifies minimum lengths required for runways to have instrument approaches.

Runway length should be determined for the critical design aircraft, which is the most demanding aircraft in regular, or substantial, use at the airport. The design temperature used in the length calculation is the mean maximum temperature in the hottest month; the design temperatures at Washington airports generally fall between 65 and 85 degrees F.

Runway length objectives are summarized in the following exhibit. Longer runway lengths may be justified at certain airports based on analysis conducted according to FAA Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*.

Exhibit 6-2: Runway Length Performance Objectives

Classification	Runway Length Objective	Explanation
Commercial Service Regional Service	5,000 feet	Recommended for medium jets (40,000 pounds) at standard conditions* by the National Business Aircraft Association.
Community Service	3,200 feet	Minimum required by for an instrument approach without penalizing approach visibility minimums. Minimally adequate for air ambulance aircraft such as King Air and B200 (Wenatchee Executive Flight) and the new Very Light Jets (VLJ).
Local Service	2,400 feet	Adequate for 75 - 95% of the small aircraft fleet, using 65 – 85 degrees F for the design temperature. Minimum length required by FAA for an instrument approach.
Rural Essential	No objective	Not applicable
Seaplane Bases	No objective	Not applicable

*
Standard conditions are 59 degrees F and sea level.

Note: Airport conditions may warrant a longer runway or an individual airport may require a longer runway for its critical design aircraft.

Taxiway

The taxiway objective relates to whether or not aircraft must taxi on the runway before takeoff or after landing. The lack of a full-length parallel taxiway connected to both ends of a runway reduces its capacity for aircraft operations. A parallel taxiway enhances safety by reducing the potential of taxiing aircraft colliding with aircraft departing or arriving on the runway. A full-length parallel taxiway is considered "fundamental" development for airports included in the NPIAS by FAA Order 5090.3C. However, FAA Order 5100.38C states that a partial parallel taxiway may be considered at NPIAS general aviation airports where the cost to construct the full length is excessive and the benefits do not warrant it. A parallel taxiway is required for a runway to have an instrument approach with visibility minimum lower than one statute mile. (A parallel taxiway is recommended for runways with higher visibility minimum instrument approaches.) One of FAA's runway gradient standards is for a runway to provide line of sight from one end to the other at a point five feet above the runway. If the runway has a full length parallel taxiway, the line of sight requirement is only for each half of the runway.

For Commercial Service, Regional Service, and Community Service Airports, the taxiway objective is:

- The primary runway has a full-length parallel taxiway.

For Local Service and Rural Essential Airports, the taxiway objective is:

- The primary runway has turnarounds at both ends that are deep enough for the design aircraft to stop beyond the hold line.

Turnarounds provide areas suitably surfaced and wide enough for aircraft to turn 180 degrees. If the primary runway at Rural Essential Airport or a Local Service Airport has a parallel taxiway, it more than meets the objective to have a turnaround at both ends.

Instrument Approach

The type of runway approach available at an airport—visual or instrument—determines whether or not the airport can be used in rainy, foggy, snowy, and dark conditions.

Visual approaches require that conditions be sufficiently clear so a pilot can see clearly without assistance from additional equipment.

Instrument approaches, on the other hand, have ceiling and horizontal visibility minimums that determine how bad the weather can be for the airport to remain open.

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Runway approach instrumentation enhances safety and the level of service of an airport. Instrument approaches provide pilots with navigational guidance to ensure they will avoid hazardous obstructions near their path to the runway. Without an instrument approach procedure, a runway can only be used in visual meteorological conditions, which means the pilot can see to avoid terrain and other obstacles while landing. Having an instrument approach that allows the airport to remain open in most weather conditions increases the reliability of air service, which is vital at Commercial Service Airports. Minimal airport closure due to weather "below minimums" is very important at any airport used for business aviation; business aviation typically flies by Instrument Flight Rules (IFR) all the time. An all-weather airport is also important at smaller airports for medical evacuation and other emergency purposes.

Until Global Positioning System (GPS) satellite navigation became available, ground-based navigational aids were required at or near an airport for it to have an instrument approach. Before GPS, there were only

non precision and precision instrument approaches, which used a variety of navigational aids. A non precision approach provides a pilot with two-dimensional guidance to a runway, while a precision approach, such as an Instrument Landing System (ILS), also provides a third dimension--glide slope guidance. GPS-aided approaches are three dimensional. However, until the Wide Area Augmentation System (WAAS) was established in 2003, GPS approaches were only possible for visibility minimums comparable to non precision approaches — one statute mile. WAAS consists of ground-based transmitters located around the country to improve the accuracy of GPS signals. WAAS-aided GPS approaches are possible down to one-half mile visibility minimum—comparable to an ILS.

For Commercial Service and Regional Service Airports, the instrument approach objective is:

- At least one runway end has an instrument approach with approach visibility minimums lower than ¾ mile.

For Community Service Airports, the instrument approach objective is:

- At least one runway end has an instrument approach with approach visibility minimums of 1 mile or less.

Lighting

Runway lights help pilots identify the runway location as they approach the airport to land.

Runway lighting refers to the type of edge lighting provided around the runway. Runway lights help pilots identify the runway location as they approach the airport to land.

- The FAA requires High Intensity Runway Lighting (HIRL) or Medium Intensity Runway Lighting (MIRL) for instrument approaches with visibility minimums lower than one statute mile. HIRL is only required for runway visual range (RVR)-based minimums.
- MIRL or Low Intensity Runway Lighting (LIRL) is required for instrument approaches with higher visibility minimums, although the FAA recommends installing MIRL instead of LIRL.

Runway lighting also helps pilots see visual runways at night. Where an airport lacks electrical power or where runway lights are not affordable, reflectors can be used to outline a visual runway. The approaching aircraft's lights are reflected, providing the pilot a better view of the runway location.

For Commercial Service, Regional Service, and Community Service Airports, the lighting objective is:

- Runway edge lighting is medium or high intensity (MIRL or HIRL).
- For Local Service Airports, the lighting objective is:
- The primary runway has edge lighting, low intensity LIRL or better.
- For Rural Essential Airports, the lighting objective is:
- The primary runway has reflectors or better (LIRL, MIRL, or HIRL)

Visual Glide Slope Indicators (VGSI)

VGSI are navigational aids that improve the safety and functioning of visual approaches.

VGSI are navigational aids that improve the safety and functioning of visual approaches. Lights convey to the pilot whether the aircraft is on the appropriate glide path to the runway threshold. Specifically, the various sequences of lights convey to the pilot whether the aircraft is above, below, or on the appropriate glide path to the runway threshold. Several different types of VGSI are in use, including the Precision Approach Path Indicator (PAPI), Visual Approach Slope Indicator (VASI), Pulsating Approach Slope Indicator (PLASI), and Pulsating Visual Approach Slope Indicator (PVASI).

The VGSI objective for Commercial Service, Regional Service, Community Service, and Local Service Airports is:

- Both ends of the primary runway have visual glide slope indicators.

Weather Reporting

Weather reporting on a real-time basis is important to aviation safety, particularly in areas where visibility can decrease quickly.

Weather reporting on a real-time basis is important to aviation safety, particularly in areas where visibility can decrease quickly. In addition, weather reporting equipment that can provide a certified altimeter reading is required for a runway to have an instrument approach. The types of weather reporting equipment are Automated Weather Observation System (AWOS), Automated Surface Observing System (ASOS), and SuperUnicom, which is a less costly system than AWOS or ASOS and provides fewer certified weather readings.

Weather reporting systems are identified in the performance objectives for Commercial Service, Regional Service, and Community Service airports. WSDOT is conducting a statewide study to determine where frequent adverse weather conditions may warrant weather reporting equipment at

Local Service airports, Rural Essential airports, or at off-airport locations such as mountain passes.

For Commercial Service and Regional Service airports, the weather reporting objective is:

- The airport has an automated weather reporting system (AWOS or ASOS).
- For Community Service Airports, the weather reporting objective is:
- The airport has an automated weather reporting system (Super Unicom, AWOS, or ASOS).

Dock Facilities

This objective applies only to Seaplane Bases. The objective is for the Seaplane Base to have a dock to facilitate passenger loading and unloading.

Service Objectives

Airport service performance objectives address fuel sales and aircraft maintenance.

Fuel Sales

Having fuel available for sale is an airport service that supports the viability of an airport and represents a potential source of revenue for the owner/operator.

Having fuel available for sale is an airport service that supports the viability of the facility and represents a potential source of revenue for the owner/operator. However, the investment in fuel-dispensing systems and storage is not economically feasible at low activity airports. Airports typically used only by piston-driven aircraft need 100LL (100 octane low lead) fuel available. Airports that are used frequently by jet and turboprop aircraft also need Jet A fuel available for sale.

For Commercial Service and Regional Service airports, the fuel sales objective is:

- 100LL and Jet A fuel sales are available.

For Community Service Airports, the fuel sales objective is:

- 100LL fuel sales are available.

Maintenance

Having aircraft maintenance service available is important, particularly at larger airports. This service provides annual maintenance checks that are required by the FAA for aircraft to operate. Maintenance levels identified for performance criteria are Full-Service Fixed Base Operator (FBO), Major Maintenance, and Minor Maintenance.

A Full-Service FBO is a business at an airport that provides a range of aircraft services, usually in addition to fuel sales.

A Full-Service FBO is a business at an airport that provides a range of aircraft services, usually in addition to fuel sales. The FAA defines a fixed base operator as "an individual or firm operating at an airport and providing general aircraft services such as maintenance, storage, and ground and flight instruction." In their minimum standards for commercial aeronautical activities, airport owners often establish facility and service thresholds for businesses to be considered FBOs.

Major Maintenance refers to repairs that may affect weight, balance, structural strength, power plant operations, flight characteristics, or other qualities affecting air worthiness.

Minor Maintenance is general or preventative maintenance other than major maintenance.

Commercial Service Airports perform well in most categories. The two privately owned seaplane bases and island airports are generally the most deficient.

For Commercial Service and Regional Service airports, the maintenance objective is:

- Full-service FBO and major maintenance services are available.

For Community Service Airports, the maintenance objective is:

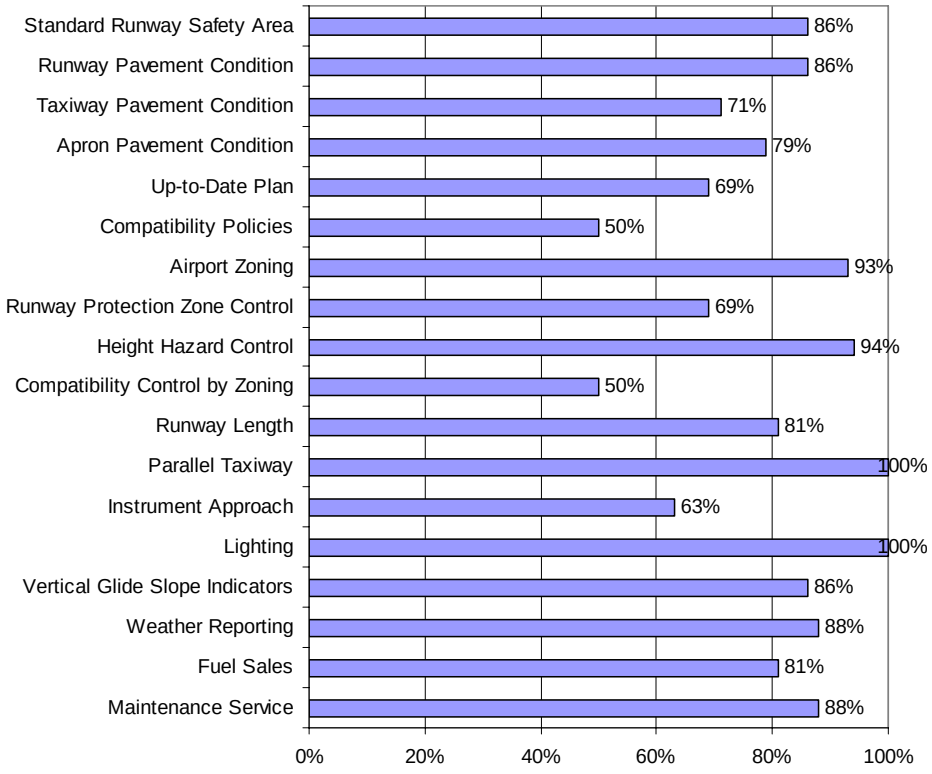
- Minor maintenance service is available.

Washington State System Performance

Commercial Service Airports Performance Assessment

Commercial Service Airports perform well in most categories. According to the FAA's 2007 Regional Airport Plan, projects planned in 2007 and 2008 will bring the nonstandard runway safety areas at Sea-Tac International and Yakima Air Terminal into compliance with design standards, at which time 100 percent of Commercial Service Airports will comply with that objective. However, only half of the 16 Commercial Service Airports are protected by land use compatibility policies and zoning that discourages incompatible development around the airport. The number of airports with at least one instrument approach with a visibility minimum lower than three quarters of a mile is also relatively low, 63 percent. The two privately owned seaplane bases (Kenmore Air Harbor SPB and Kenmore Air Harbor Inc.) and island airports (Anacortes, Friday Harbor, and Orcas Island) are generally the most deficient in the performance assessment.

Exhibit 6-3: Commercial Service Airports Performance Assessment

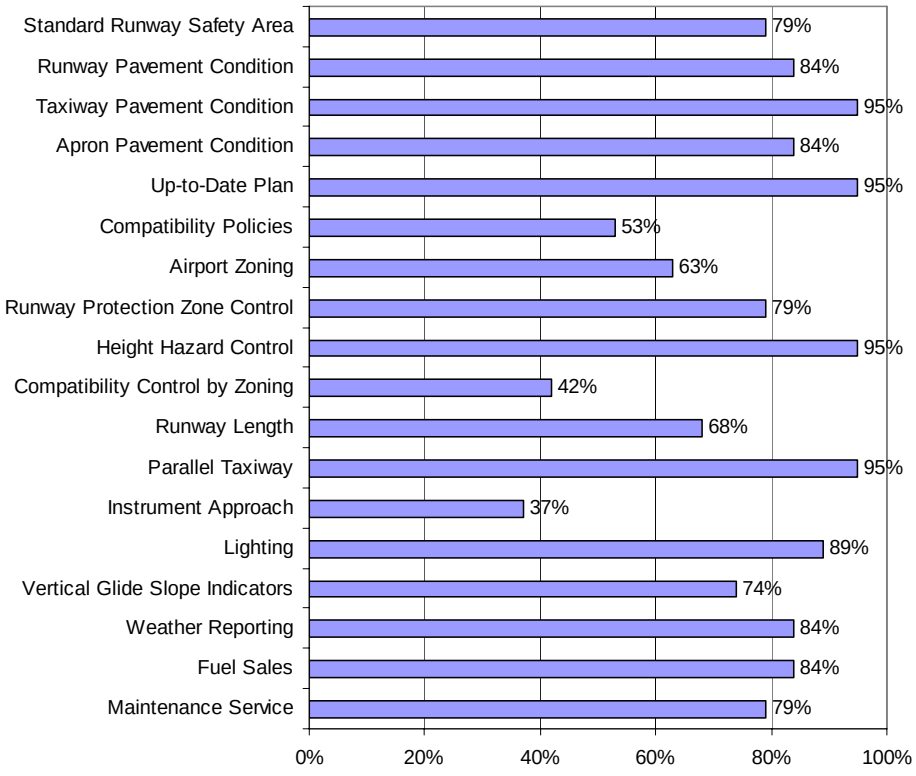


Regional Service Airports Performance Assessment

The percentage of Regional Service Airports meeting their performance objectives was slightly lower in most categories than the Commercial Service Airports, which were measured by the same objectives. Regional Service Airports scored higher in taxiway and apron condition and in having up-to-date plans than Commercial Service Airports. However, fewer than half of the 19 Regional Service Airports are protected by land use compatibility policies and zoning that discourages incompatible development around the airport. In addition, only 37 percent of the airports meet the instrument approach objective.

Being only a "placeholder" for New Northeast Washington Regional Airport, it is not surprising that Colville Municipal is deficient in meeting the majority (ten out of 18) of the Regional Service Airport objectives. Harvey Field, a privately owned reliever airport, also does not meet ten of the 18 Regional Service Airport objectives.

Exhibit 6-4: Regional Service Airports Performance Assessment

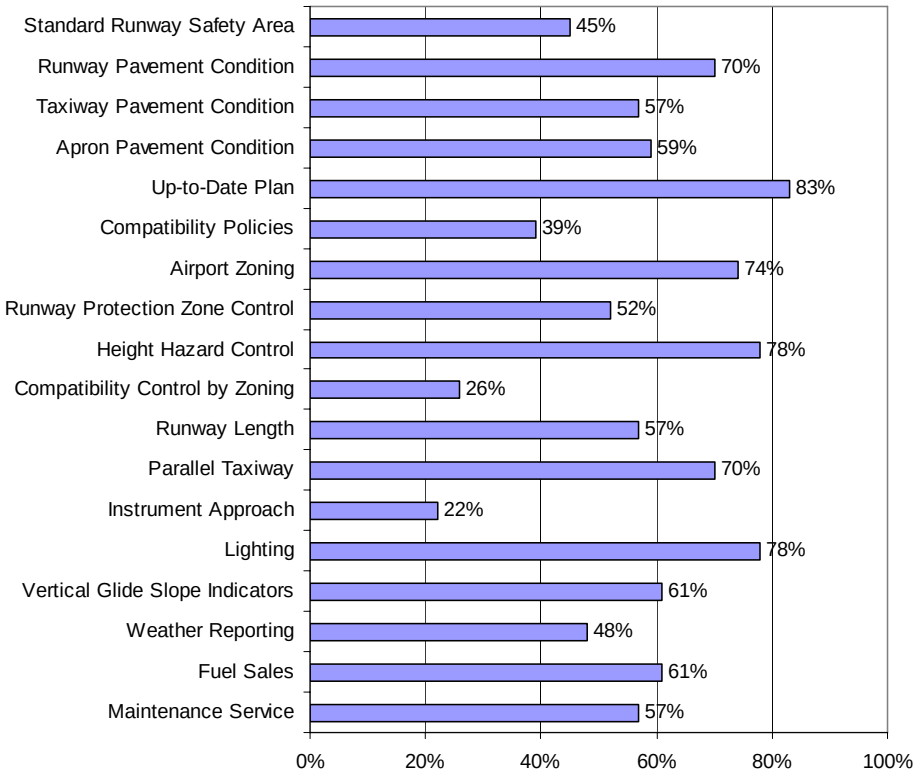


Community Service Airports Performance Assessment

For most objectives a smaller percentage of Community Service Airports meet the objectives than Regional Service Airports. The majority of the objectives show compliance by more than half of the 23 Community Service Airports.

Unfortunately less than half the Community Service Airports have compliant runway safety areas. So far, the FAA has focused runway safety area improvement funding on commercial service airports and airports with more than 75 based aircraft, so it is probably not surprising that runway safety area compliance is considerably lower in this classification, which has many airports with fewer than 75 based aircraft and some airports that are not in the NPIAS. The two objectives that are most deficient are compatibility control by zoning and instrument approach. The objective with the highest level of compliance is up-to-date plan (83 percent).

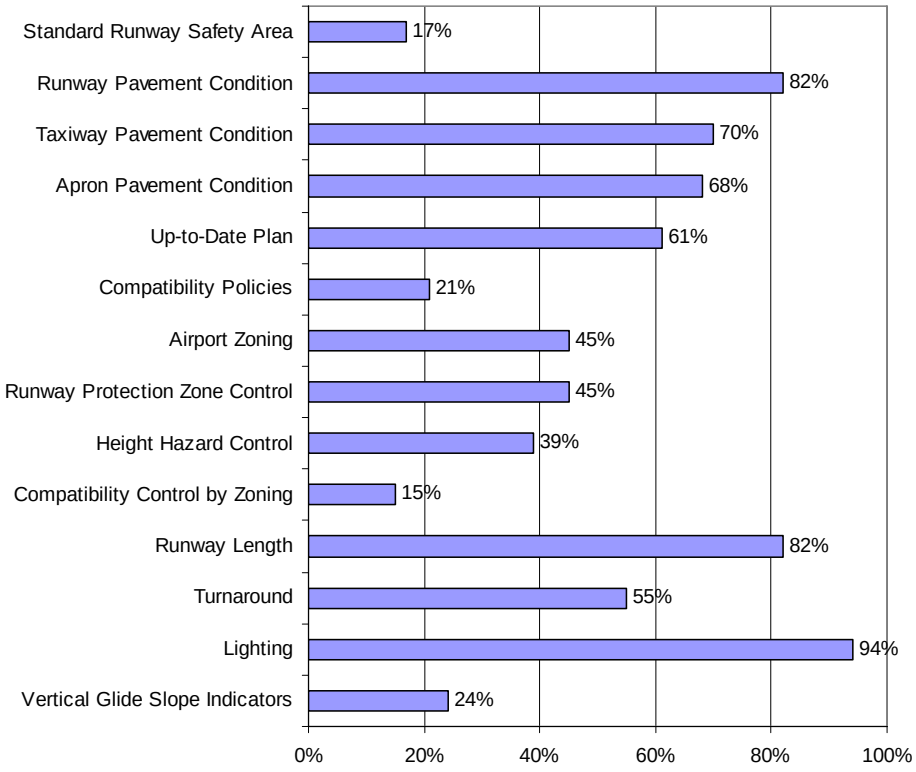
Exhibit 6-5: Community Service Airports Performance Assessment



Local Service Airports Performance Assessment

The 33 Local Service Airports show a wide range of compliance with performance objectives, from a low of 15 percent for compatibility control by zoning to a high of 94 percent for lighting. For both runway pavement condition and runway length, 82 percent of the Local Service Airports meet the objective. Less than half of the objectives showed compliance by more than half of the Local Service Airports, indicating a lower level of performance than Community Service Airports.

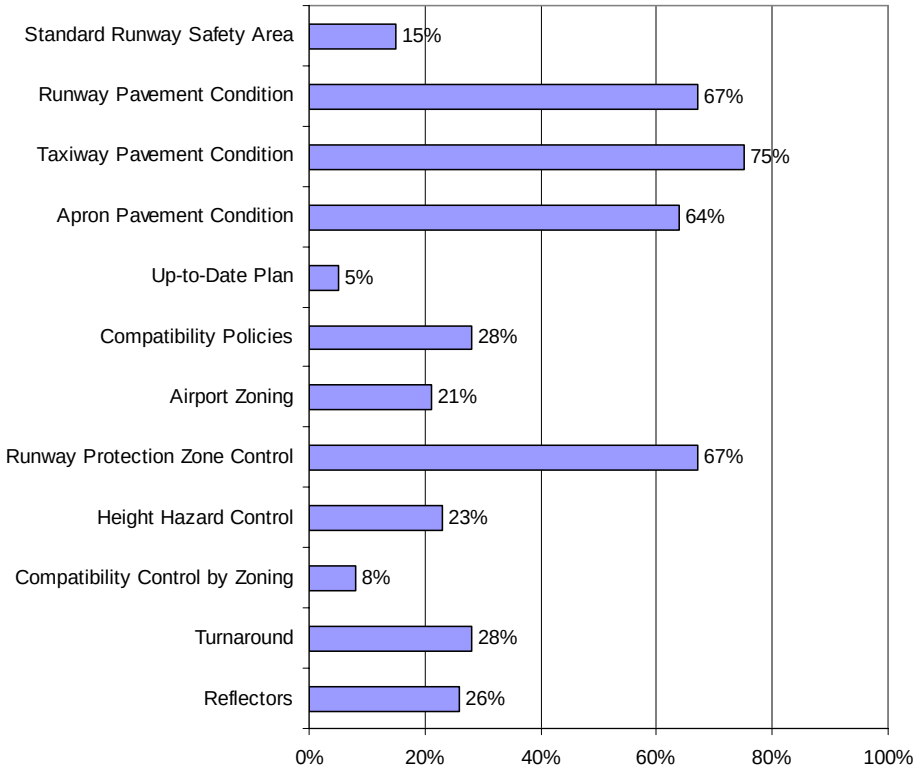
Exhibit 6-6:: **Local Service Airports Performance Assessment**



Rural Essential Airports Performance Assessment

The 39 Rural Essential Airports show lower compliance with objectives than Local Service Airports. The three pavement condition objectives and the RPZ control objective show the highest level of compliance, between 64 percent and 75 percent, although it should be remembered that the PCI objectives are only measured for airports with paved runways, taxiways, and aprons. Many airports in this classification have only turf or gravel runways. After those four objectives, the highest level of compliance is only 28 percent, for compatibility policies and turnarounds. Only 5 percent of the airports in this classification have up-to-date plans. Compared to the other classifications, more Rural Essential Airports lack the data needed to assess performance. The preparation of more Airport Layout Plans would provide more data for performance assessment. More of these airports are privately owned than in other classifications, which is probably a significant reason for the incompleteness of data for assessing performance and for performance objective deficiencies.

Exhibit 6-7: **Rural Essential Airports Performance Assessment**



Seaplane Bases Performance Assessment

Seaplane Bases is the smallest classification, with only nine airports. The all-classification performance objectives were modified to be relevant to Seaplane Bases by eliminating objectives relevant only to land-based airports. Compliance is low except for control of the RPZs, which is probably because most of the RPZs do not extend onto land. None of the Seaplane Bases reported appropriate airport zoning, which may be appropriate because water is generally not zoned. The Seaplane Bases also did not report height hazard controls for their facilities. Only one facility objective is measured, whether or not the facility has a dock to facilitate passenger loading and unloading. Eighty-nine percent of the Seaplane Bases have a dock facility.

Exhibit 6-8: **Seaplane Bases Performance Assessment**