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Alaska Aviation System Plan

FACT SHEET

Updated March 2024

Rural Airport Lighting

A Critical Need

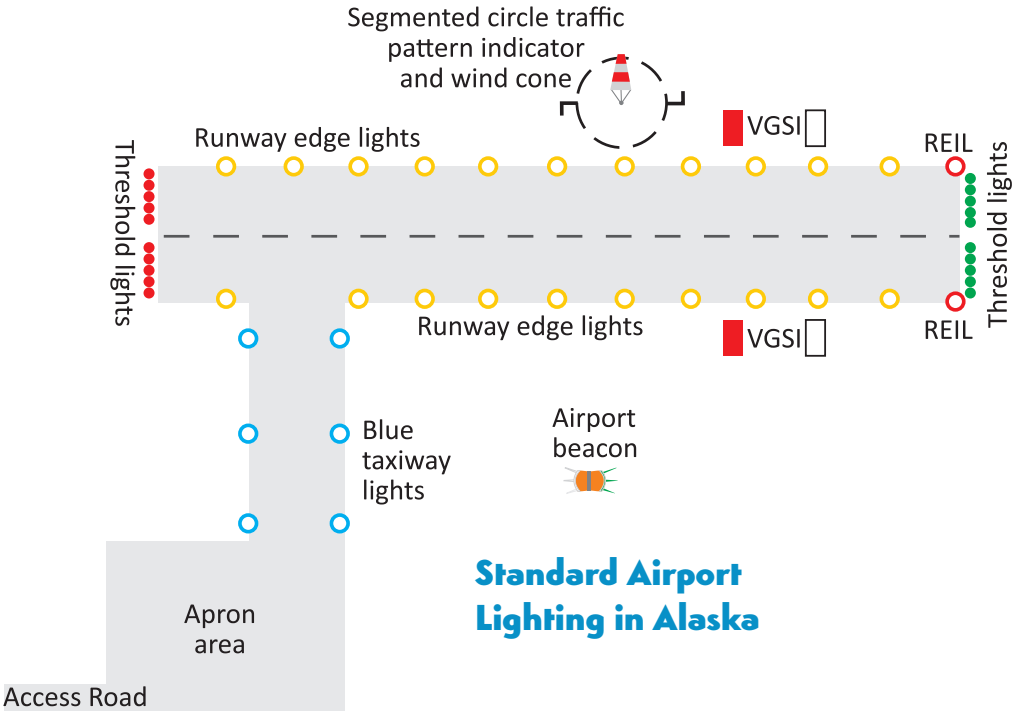
Runway lights can be seen on the approach to Galena in low visibility conditions.

Airport lighting systems help pilots locate the runway and identify where to land. They supplement an aircraft's on-board instruments and provide a visual on-the-ground reference to pilots. In Alaska, over 80 percent of communities lack year-round accessibility to the road system and are completely reliant on their local airport for medical transport, mail service, supplies, and connections to the outside world. Many small communities on the road system also rely on aviation for transport of acutely ill patients to advanced medical care facilities. Airport lighting is a crucial component that enables safe aircraft operations at night and when visibility is reduced by fog, blowing snow, wildfire smoke, and combinations of weather and low light. Airport lighting is necessary to land medevac planes at night in the event of a medical emergency.

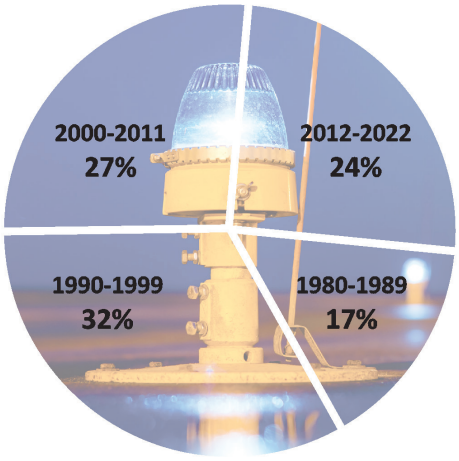
The most northern airports experience nearly continual darkness during winter, with those above the Arctic Circle seeing no significant sunlight from early October through early March. Two notable examples are Wiley Post-Will Rogers Memorial Airport (BRW) located in Utqiagvik, Alaska, and Deadhorse Airport at Prudhoe Bay, where the sun does not rise above the horizon for over 60 days each winter. Many airports in remote locations across Alaska are also devoid of landmarks and visual reference points such as highways, lighted towers, or identifiable terrain features. These unique conditions can make lighting systems at Alaska's rural airports—both remote airstrips and hubs—a critical necessity. As of early 2024, out of 243 total runways at the 235 airports managed by DOT&PF, 179 have lighting and 64 are unlit.

It is important to note that some airports are likely to remain unlit due to topography—such as rugged mountains immediately adjacent to the runway—which makes landing at night or in low visibility dangerous. Adding runway lights is not likely to significantly improve safety in these situations, where flying operations should be avoided at night or in low visibility conditions due to topographical challenges.

Runway edge lighting at the Coldfoot Airport.



Standard Airport Lighting in Alaska



DOT&PF runway lighting systems installed or replaced by year.

Airport Lighting Basics

Common airport lighting consists of runway and taxiway edge lights, runway threshold lights, a rotating airport beacon, and a lighted wind cone. Edge lights are classified by their brightness: high intensity runway lighting (HIRL) and medium intensity runway lighting (MIRL). In Alaska, about 20% of lit runways have HIRL and 80% have MIRL. Some airports have runway end identifier lights (REILs). These components are the most common configuration at smaller airports. Larger airports that serve jet traffic usually have multiple runways and significantly more electrical infrastructure.

Edge lights outline the usable landing surface of the runway, while threshold lights mark the runway ends, with green lights indicating the beginning of the runway and red lights marking the end. REILs enhance rapid and positive identification of the runway end with a pair of synchronized flashing lights located laterally on each side of the runway threshold. About one third of runways in Alaska have REILs on at least one end. The FAA requires that any airport equipped with runway edge lighting also have a rotating beacon. Civilian airport beacons flash an alternating white and green light and can usually be seen from 10 miles or more, depending on weather conditions.

Ideally a small airport will also have visual glide slope indicators (VGSI) to provide approach angle guidance, as well as taxiway lighting to outline the operating area of the taxiway. VGSI include older visual approach slope indicators (VASI) and newer precision approach path indicators (PAPI). VGSI are Federal Aviation Administration (FAA) owned and operated navigational aids.

Challenges Keeping Alaska's Lights On

Aging Infrastructure

Alaska's vast and unforgiving landscape contributes to unique challenges when it comes to keeping the lights on across the system. Systems are deteriorating for several reasons, including limited funding and harsh environments. Skilled DOT&PF maintenance crews keep older systems in operation well past their expected lifespan, despite these challenges. A recent evaluation of DOT&PF rural airport lighting found that over 75% of systems were installed before 2012 and the average age of runway lighting systems in Alaska is about 20 years.

Damage to edge light base, likely from snow plowing.

Damage can occur due to embankment failures, settlement, erosion, and permafrost thaw, as seen here with a runway edge light in Noorvik.

The FAA designates 10 years for useful life of airfield lighting, meaning that lighting replacements and rehabilitations are not eligible for funding until after that timeframe. "Minimum useful life" is a guideline for funding eligibility and does not necessarily indicate system failure. The industry average for replacing airport lighting systems is about 15 years. "Physical life," the length of time that a system remains operable, can vary greatly depending on the quality of the initial installation and environmental factors such as snowfall, temperature, ground stability, snow removal techniques, preventative maintenance, and power source variables.

Lighting Maintenance

Most airports are maintained by contracted personnel from a nearby community or village. These contractors are tasked with snow removal, and most do not have the training

Threshold lights (orange), elevated runway end lights (red/green) and taxiway lights (blue) at Anchorage International.

to work on lighting systems. Due to the unique characteristics of airfield lighting systems, trained electricians are required to assess and repair them. The largest and busiest airports such as Anchorage International and Fairbanks International have dedicated airfield electricians. The remainder of the rural airport system relies on traveling electricians who fly out with tools and parts to make repairs. Many airports in rural areas—especially in off-road communities—lack housing facilities to accommodate traveling electricians. In instances where airfield lighting fails during a weather event, an airport and the local community may wait days or weeks for an electrician to arrive and for repairs to be made. A national shortage of electricians qualified to work on airfield lighting exists, meaning available electricians must focus their efforts primarily on keeping up with emergency repairs, furthering the challenge of keeping aging systems running and runways lit.

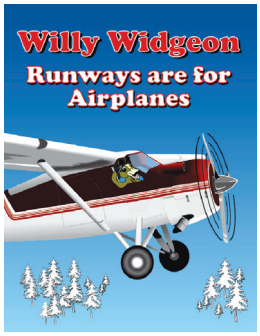
Weather and Climate Change

Harsh winter conditions, heavy snowfall, and icing all contribute to reduced life expectancy for lighting systems. Most rural airports have one equipment operator and one or two plows for snow removal. Contracted airports often lack the personnel or smaller equipment, such as snow blowers, to blow the snow up and over runway edge lights to lower the risk of lighting damage. This creates challenges for single operators attempting to keep runways open and free of berms, without covering or damaging edge lights. Damage to the above-ground components (edge lights) often results in more insidious damage to the buried infrastructure, including breaks in light bases which allow water to enter the system. Water in an electrical system is an obvious problem worsened by expansion from freezing and thawing, accelerating the damage. Climate change is also significantly impacting lighting systems. Embankment failures, settlement, flooding, erosion, permafrost thaw, shoulder rolling, and surface cracking are all becoming increasingly prevalent as temperatures rise and precipitation increases. All of these conditions can negatively impact life expectancy.

Challenges

Airport lighting requires a stable and reliable power source to maintain reliability and extended life. Since many rural airports and gravel strips are located outside or on the fringe of small, remote communities, providing a power source that does not experience fluctuations in voltage or frequent outages can be an obstacle.

Vandalism and accidental damage to lighting is another challenge faced by unstaffed airports. Since most airports are not fenced, people can cause damage through the unauthorized use of vehicles on the runway and large wildlife such as moose, caribou and musk ox can also create issues. DOT&PF and local communities are working to address damage to lighting systems. In 2018, the Association of Village Council Presidents issued a resolution calling for the prevention of vandalism and damage to rural airports and runways in the Yukon-Kuskokwim Delta. DOT&PF even developed a coloring book to get both kids and adults thinking about runway safety and to educate the public about common issues that lead to lighting damage.



Creative Responses

DOT&PF owns battery-powered modular lighting systems that can be driven or flown to a community and installed along the runway if lights are down and needed, and seven emergency lighting trailers are staged across the state. Many airports are also equipped with emergency lighting capability through a pack of six emergency lights that can be deployed as needed. When modular lights are not deployed, Alaskans have creatively responded to the predicament: in communities including Deering and Igiugig, residents lined up cars, trucks, and ATVs along the runway to help incoming medevac planes land at night using vehicle headlights.

Planning for Lighting Projects

Given the immense need and challenges faced, planning for the funding and upkeep of airport lighting is paramount to keeping airports operational and

Ever wonder what those orange boxes along the side of a gravel runway are? They are visual glide slope indicators (VGSI), either visual approach slope indicators (VASI) or precision approach path indicators (PAPI). These lights help guide pilots down towards the runway, showing a specific configuration if the pilot is on the correct approach slope or angle throughout their descent.

Andrew Warner, DOT&PF (2)

DOT&PF's emergency lighting trailers include 38 modular lights that can be pulled by an ATV or flown to rural airports. They can burn for up to 8 hours on a full battery charge.

communities connected. FAA Airport Improvement Program (AIP) grant funding is available for installing and rehabilitating lighting projects but given that DOT&PF owns and operates over 200 airports, the need outweighs available funding. Large scale, capital funded projects require significant expenditure to mobilize crews, materials, and equipment. The current practice is to align lighting projects with resurfacing work, such as a pavement rehabilitation, to minimize mobilization expenses. An added benefit to this approach is that

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Airports with multiple runways feature lighted runway and taxiway signs to guide pilots, like this one in Unalakleet.

work on underground lighting components can be completed when the runway surface is already disturbed. This practice is efficient and cost effective but does not always address situations where lighting is an immediate need. As more airports are illuminated, additional funding is needed to maintain those systems, which adds pressure to already limited state budgets, since federal funding does not supplement day-to-day maintenance activities. In the last 20 years, DOT&PF has installed lighting at many airports that were previously unlit and has replaced or is in the process of replacing systems at 33 runways. Over the next four years, DOT&PF has over 40 airport projects planned that include lighting improvements. Tools including a Rural Airfield Electrical Testing Checklist and Airport Lighting Assessment and Planning Questionnaire were developed through the 2021 Lighting Analysis for Rural Airports study. DOT&PF is now implementing these tools to standardize testing procedures and prioritize lighting projects. The Department also recently adopted a new focus on resiliency in infrastructure: exploring ways to increase the life expectancy of systems most impacted by climate change.

At right: A rotating airport beacon at Ambler airport in Northwest Alaska.

Conclusion

Airport lighting is critical to the mission of reliable transportation and access to goods and services. Without it, medevac pilots cannot reach destinations and remote Alaska becomes increasingly more remote. There are many challenges to keeping Alaska's airports lit but just as many creative solutions by residents, aviators, and agencies alike. The DOT&PF has long recognized its importance to rural communities and industry and continues to improve airport lighting systems to keep Alaska moving through service and infrastructure.

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The AASP project is managed by the State of Alaska Department of Transportation and Public Facilities (DOT&PF), Division of Statewide Aviation. Additional assistance is provided by the Aviation Advisory Board, private aviation organizations, local airport sponsors, air carriers, aviation related businesses and pilots.

The preparation of this document was supported in part with financial assistance through the Airport Improvement Program from the Federal Aviation Administration (AIP Grant # 3-02-0000-028-2021) as provided under Title 49 USC § 47104. The contents do not necessarily reflect the official views or policy of the FAA. Acceptance of this report by the FAA does not in any way constitute a commitment on the part of the United States to participate in any development depicted therein, nor does it indicate that the proposed development is environmentally acceptable in accordance with appropriate public laws.