

# Briefings

A publication of the Airport Technical Assistance Program of the Center for Transportation Studies at the University of Minnesota

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## State's airports face unknowns in unleaded avgas transition

The aviation industry and the FAA have established a goal of removing lead from aviation gasoline, or avgas, no later than 2030. While that's more than five years out, Minnesota's airports may feel the clock ticking.

The most common type of avgas used and sold at general aviation (GA) airports is 100-octane low lead (100LL). Currently several companies are developing and testing 100-octane unleaded fuel alternatives, but only one has received approval (G100UL), and its supply is limited. A 94-octane unleaded (UL94) fuel has been available since 2015 from manufacturer Swift Fuels. Currently two GA airports in Minnesota—Fleming Field—South St. Paul Municipal Airport and Stanton Airfield—sell UL94 and 100LL.

Many questions about the transition airports will need to make—from phasing out low-lead fuel sales and offering only unleaded avgas—remain: Will airports need additional fuel tanks? Can fuels be mixed? How will new fuels be supplied? And—perhaps most important—will funding be available to support the transition?

Airport manager Andrew Wall of Fleming Field—South St. Paul Municipal Airport has been weighing these and other questions for some time. The airport has offered UL94 since 2018 alongside 100LL.

So far, the 100LL outsells the UL94 by a large margin, Wall says—something he attributes mostly to the price difference: UL94 is currently about \$1.50 more per gallon. “Pilots want to find the least expensive way to operate,” he says. “I think [UL94] is a good product, it's just not as widely used, and not as proven as the 100LL.”

To use UL94 in an aircraft engine, a pilot needs to obtain a supplemental type certificate (STC) from the fuel manufacturer. About two-thirds of the US GA piston fleet can use this fuel, while the remaining third consists of high-compression engines

requiring a 100-octane fuel, according to industry sources.

Like many products, the price of unleaded avgas is affected by the cost of producing and transporting it. The volume that the airport buys and the volume that is produced overall is much less than 100LL, Wall says.

“We have to get buy-in from the refineries. But what I'm hearing is it's still going to be a dollar or more per gallon [than LL]...I don't think [unleaded] is going to take off until it's the only option available, even if there's an environmental benefit to doing so.”

Wall also notes that there are different regulations—and added costs—when working with a product containing lead. “With lead you have to dedicate certain equipment to that only,” he says. That has implications not just for fuel storage on the airport but also for transport *to* the airport.

Working closely with consultant SEH, South St. Paul is planning to upgrade and replace its fuel system and tanks over the next few years. The airport currently has three tanks: a 10,000-gallon tank for 100LL, a 6,000-gallon tank for UL94, and a 10,000-gallon tank for Jet A fuel. Wall says the project will require anticipating what types of fuel will be available and in use in the future and planning for the needed volumes of fuel, including delivery and storage. “Another thing to figure out is if we have 100LL in our new tank, what kind of cleaning requirements are we going to have to go through with our equipment?”

Funding will be another challenge. Historically the FAA hasn't funded fuel system replacement but has funded moving one, Wall says.

Lindsay Reidt, senior engineer in airport planning and design with SEH, agrees. She expects South St. Paul's project to cost over \$1 million and to rely on state and local funding sources only.

SEH is working with the airport and



Refilling UL94 tank at South St. Paul Airport

agencies to coordinate funding opportunities and programming into the airport's CIP. Once funding is available, SEH will help with grant applications and work on design and administering construction. Design will likely start in late 2024 or early 2025, with construction taking place in 2026.

Another challenge will be managing the transition to UL availability and the interim during the switch—“meaning both storage of the fuel (the number of tanks available, split tank options) and pilot/user expectations and acceptance of the change,” Reidt says.

From her observations, Minnesota GA airports are just starting to prepare for the transition. “It seems to be a slow progression and it hasn't been flawless. There is a contradiction of information, which can make proceeding and acceptance challenging,” she says. She advises airports to take advantage of near-term projects to plan for the switch (such as split tanks for future diversification), and to plan now because of the life expectancy of fuel systems. “With a typical 30-year useful life, these projects don't happen often, so it's important to plan ahead,” she says.

Wall encourages airports to tap into their relationships—with their FAA program

*Avgas continued on page 4*

# Airport lighting technologies: How close are we to LED everything?

By Casey Carlson, MnDOT Aeronautics

Minnesota's public airports are getting close to having upgraded LED lighting systems. The past several years have seen numerous enhancements to LED light fixtures and their uses on our airports. The brilliant glow of brand-new LED edge lights can now be seen at many airports throughout the state.

A common misconception is that the hold-up for full integration of LED lighting has been the light bulb itself. In reality, other requirements of LED technology have caused delays.

One challenge is that Minnesota's [usually] cold, snow-filled winters create some extremely difficult conditions for these LED fixtures to operate outside. When snow gets blown into tiny cracks, it can disturb sensitive electronics. Also, the frigid temperatures tend to shorten the usable life of the components. For example, if a runway edge light is upgraded, in order for that fixture to function as an LED, a provision must be built into the fixture assembly to keep the glass defrosted under harsh conditions. While the traditional incandescent and halogen lights lack the efficiency of LEDs, their "wasted energy" is expelled as heat, which keeps the globes and lenses nice and clear. LED lighting typically runs much cooler than traditional lighting, because traditional "old tech" lighting is less efficient.

If we save energy by switching to LEDs but lose efficiency by adding a heating element, is there enough savings to warrant the upgrade? The short answer is: Yes, there is! An LED fixture head with the cold

weather kit (arctic kit) uses anywhere from 24 to 29 watts. A standard halogen uses up to 45 watts. Beyond the energy savings, some manufacturers boast a 50,000-hour rated life on their LED lights, compared to a conventional halogen light that lasts 1,000 hours on average.

We have seen some airports with low-intensity runway lights on a 120-volt system (not constant current) screwing household LED bulbs into their sockets. Will they turn on? Yes, but there's no guarantee that the bulbs will generate enough heat to thaw off the frosty globe covering the bulb. This practice is not recommended.

LED precision approach path indicator (PAPI) lights are available in the marketplace as well. Are you tired of changing the bulbs on your traditional PAPIs? Put that problem behind you, as there are no bulbs to change on the new LED models. A single LED PAPI housing uses approximately 85 watts, while some old fixtures used as much as 500 watts depending on the lamp configuration. Like the runway edge lights, halogen bulbs in a PAPI have a 1,000-hour rated lamp life compared to a 50,000-hour rated life for the LED version. A couple of other features of note with the LED PAPIs: there are no red filter lenses to break, and many of the newer PAPIs have internal aiming capabilities to help with proper glideslope aiming—so you won't have to guard your aiming/leveling tool like a hawk anymore. Make sure the LED PAPI has the cold weather kit installed for cold climates.

LED runway end identifier lights (REILs) are available, too. Traditional REILs can be a challenge to maintain because of the complex flash process. Also, the controls cabinet (commonly called the "tub") is full of components such as capacitors, transformers, relays, and a rectifier. Many of those components are no longer needed in today's modern LED REIL. And micro-LEDs on the main circuit board can greatly help with diagnostics and troubleshooting. The new technologies provide a consistent bright flash with lower energy costs and lower maintenance costs.

LED rotating beacons are here, but they

**Important note about LED lighting:** LED bulbs should not be mixed in among older technologies. The difference in color temperature, intensity, and light pattern can result in inconsistencies from light to light—which in turn could throw off a pilot's perception of the nav aids and cause unnecessary hazards.

haven't been around for long. A quick internet search indicates that the first one was installed on March 10, 2021, in Boca Raton. Reduced maintenance costs are a big benefit of these systems, when you consider that maintenance staff must climb up the beacon tower to maintain the fixture. Another great feature is a more directed light beam on the LED beacon fixtures, which leads to less light pollution over our cities.

Medium approach lighting system with runway alignment indicator lights (MALSR) and medium approach lighting system flashing (MALSF) systems have not yet crossed the hurdle of LED migration. A MALSR or MALSF system is made up of a series of flash heads and several "light bars" containing five steady burner lamps on each bar. We know from the REIL information that LED flashing is not a problem. Instead, the issue lies with the steady burner lamps. The lamps screw into an exposed screw shell and the lamps sit in the open directly exposed to all the elements. There is no globe or lens to protect an LED bulb, so the LED bulb must be constructed so that it can thaw the frost and fog that may accumulate on the front of the lens. There are rumors that an LED bulb will soon enter testing for eventual certification for steady-burner sockets on MALSR and MALSF. Hopefully we will start seeing product integration to our systems within the next five years. Until then, keep screwing in those halogen and incandescent bulbs.

—Casey Carlson is MnDOT Aeronautics' airport lighting coordinator.



LED taxiway edge lights at Mankato Regional Airport

AirTAP was developed through the joint efforts of the Minnesota Department of Transportation, the Minnesota Council of Airports, and the Center for Transportation Studies (CTS). AirTAP is housed within CTS at:

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# An airport's story: Luverne Municipal Airport

Nestled in the southwest corner of Minnesota, the Luverne Municipal Airport stands as a testament to the region's growing interest in aviation. The airport boasts two well-maintained runways, houses more than 20 aircraft, and serves as the base for private skydiving company "Skydive Adventures."

Managed by Ben Baum since 2011, this small yet vibrant airport has witnessed a remarkable surge in activity over the past five years, presenting both opportunities and challenges for its management. As interest in aviation continues to rise, the need for hangars to house airplanes has become increasingly pressing.

"Aviation has really exploded over the past five years, so trying to get hangars [built] to house all the airplanes has been the biggest challenge of our airport," Baum says.

Despite this, the management team has made significant strides expanding hangar facilities to accommodate the growing number of aircraft. In 2023, a set of four new hangars was completed, providing

much-needed space for aircraft storage. Looking ahead, the airport has plans to construct a six-bay unit in 2025 to further meet the growing demand.

Beyond the efforts to add hangars, the airport recently completed a notable project with the installation of P608H asphalt treatment on its taxiway.

"It [P608H] was a new product. It had just been certified and we wanted to be one of the first to have it on because of the benefits we've heard from our engineering team," Baum says. So the airport management team jumped at the opportunity to try it.

This specialized treatment, designed to minimize raveling and weathering distress on structurally sound runways, offers a thicker and heavier alternative to standard treatments. Although a relatively new treatment, initial feedback has been positive, with users praising its grip and durability, especially during adverse weather conditions.

"So far, everybody who has been on



it...talk[s] about how sticky it is. It's very grippy," says Baum. "When it's like this and has all that grit in it, it helps with the plane staying straight."

Adding this treatment is a proactive approach toward improving the longevity and durability of the airport's pavement, Baum adds. The treatment was finished in October 2023.

"As of now, we haven't had it through the height of flying season," Baum says, but he remains optimistic about the quality of the treatment. "It held up through the plowing season, which most asphalt coatings do not."

—Emma McIntyre is the CTS communications intern.

## Maintaining Minnesota's AWOS systems

By Nick Kremer, MnDOT Aeronautics

As a pilot or member of a flight crew, you listen in to a weather briefing at the start of every flight and before landing, but have you ever thought about how that computerized voice brings you the weather and is maintained? More important, how can you trust it to make safety-critical go/no-go decisions?

In Minnesota, MnDOT Aeronautics maintains 79 automatic weather observing stations (AWOS) at local public airports throughout the state. Most state-owned AWOS stations were installed during the 1990s or early 2000s, making them quite old compared to most electronic devices. Fortunately, we have tools to monitor the system's health—plus reports from the pilots and airport managers who rely on the systems.

Every AWOS maintained by MnDOT Aeronautics is connected through a display computer in the terminal building. MnDOT Aeronautics staff monitor the network for failures, faulty sensors, and the occasional offline situation. Additionally, FAA Advisory Circular 150/5220 requires that stations be inspected quarterly or tri-annually, depending on the station model. Preventive maintenance is conducted and several parameters are verified, while barometer,

visibility, and ceilometer (sky condition) are a few of the assessments completed.

Once a year, the entire AWOS is put through an annual revalidation inspection—witnessed by an FAA inspector—that includes the checks mentioned previously but in more detail. Temperature/dewpoint, wind sensors, and radio transmitters are also checked.

The National Oceanic and Atmospheric Administration (NOAA) provides a final set of eyes on each of the state's AWOS stations. NOAA uses data from the stations and will notify MnDOT Aeronautics staff of any anomalies they notice. Should a repair be needed, a NOTAM will be issued informing pilots of the missing parameter.

All repairs and inspections to Minnesota's AWOS system are carried out through teamwork between MnDOT Aeronautics employees and a contracting firm specializing in aviation navigational aids. Eventually, every AWOS station in Minnesota will need to be replaced with newer, more modern equipment. Although that effort is underway, it will take years to complete. Minnesota also has additional weather systems that federal agencies maintain.

If you experience issues with an AWOS and a NOTAM is not in place, please notify

the MnDOT Aeronautics navaids team via email at [navaids.dot@state.mn.us](mailto:navaids.dot@state.mn.us). If you have questions about Minnesota's AWOS stations or system, contact [Nick.Kremer@state.mn.us](mailto:Nick.Kremer@state.mn.us).

Current weather information from MnDOT's 79 AWOS stations at airports throughout the state is available at [mndot.gov/aero/navigationssystem/awos-map-online.html](http://mndot.gov/aero/navigationssystem/awos-map-online.html).

—Nick Kremer is a navigation systems radio engineer with MnDOT Aeronautics.



## ✓ FAA Updates

### AIP closeouts

- All must close in FY24.
- FY19 grants all have an expired period of performance (PoP): no new expenditures are allowed.
- All FY20 grants will have the PoP expiring soon—no additional new work can be invoiced after the PoP date.
- Please send in final payments/closeout documents to MnDOT and copy FAA program managers.

### Staffing

- Tracy Schmidt retired on January 12, 2024.
- Ben Garrow's last day with the agency was January 12, 2024.
- Gavin O'Hair and Sean Johnston have joined as program managers.

### CIP meetings

The FAA is actively holding winter CIP meetings to introduce new program managers in person and plan for upcoming 2025 projects.

## 📅 Mark Your Calendar

### Basics of Airport Management Workshop

April 23, 2024  
Breezy Point, MN

### 2024 Minnesota Airports Conference

April 24–26, 2024  
Breezy Point, MN

### Wildlife Hazard Control Workshop

May 14, 2024  
Minneapolis, MN

For more on these events see [airtap.umn.edu/events](http://airtap.umn.edu/events).

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manager, their MnDOT rep, and others in the industry.

“Talk with other airports and find out what they're doing,” he says, noting that both Stanton, Minnesota, and New Richmond, Wisconsin, have experience with unleaded fuel.

“And talk with your fuel suppliers and see what they know. They might have different information than you do, when it comes to

where refineries are at [with the transition]” Wall says. Before they brought UL94 to their airport, Wall says they hosted a Swift Fuel representative to learn more. Wall also asked the airport's users if they would try UL94.

“Sign up for updates from the FAA. Keep your finger on the pulse of what's going on... Talk to other managers and pilots,” Wall advises. Currently, much of the local airport industry's focus is on PFAS cleanup, “but I

think UL will come to the surface soon,” he says. “The ball is already rolling...It's going to happen eventually, but there are still a lot of unknowns.”

—Amy Friebe is the Briefings editor.

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