Eliminate Aviation Gasoline Lead Emissions (EAGLE)

Guidance on Transitioning a Flight School to Unleaded Avgas

Version 1 – July 2023

ELIMINATE AVIATION GASOLINE LEAD EMISSIONS (EAGLE) INITIATIVE

Following the 2021 publication of the National Academies of Sciences Consensus Study Report "Options for Reducing Lead Emissions from Piston-Engine Aircraft," industry and government established the **Eliminate Aviation Gasoline Lead Emissions (EAGLE)** initiative in February 2022. EAGLE aims to:

> **Eliminate the use of leaded aviation fuels for piston engine aircraft in the United States by the end of 2030 without adversely impacting the safe and efficient operation of the existing GA fleet.**

The industry-government-leadership includes:

- Aircraft Owners and Pilots Association (AOPA),
- General Aviation Manufacturers Association (GAMA),
- Experimental Aircraft Association (EAA),
- National Aviation Business Association (NBAA),
- National Air Transportation Association (NATA),
- American Airport Executives Association (AAAE),
- National Association of State Aviation Officials (NASAO),
- Helicopter Association International (HAI),
- International Council of Air Shows (ICAS),
- American Petroleum Institute (API), and
- Federal Aviation Administration (FAA).

EAGLE's stakeholders include, but are not limited to, fuel producers and distributors, airport operators, communities surrounding general aviation airports, environmental experts, citizens, and elected officials.

The work focuses on four pillars, each led by an industry or government expert:

- Supply Chain Infrastructure and Deployment,
- Research, Development, and Innovation,
- Unleaded Fuel Evaluation and Authorization, and
- Regulation, Policy, and Programmatic Activities.

See the EAGLE website at www.flyeagle.org for the latest information on EAGLE activities. Interested parties are invited to participate in EAGLE by contacting info@flyeagle.org.

Guidance on Transitioning a Flight School to Unleaded Avgas

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Introduction

Aviation gasoline, better known as avgas, contains lead (Pb). Lead is a heavy metal used in avgas as an additive, in the form of tetraethyl lead, to boost octane and prevent engine knock. Engine knock can lead to engine damage and premature engine failure resulting in potential safety issues. The automobile industry fully transitioned to unleaded gasoline in the early 1990s and in October 2022 the U.S. Environmental Protection Agency (EPA) issued a "Proposed Finding That Lead Emissions From Aircraft Engines That Operate on Leaded Fuel Cause or Contribute to Air Pollution That May Reasonably Be Anticipated To Endanger Public Health and Welfare", known as a draft Endangerment Finding[1]. The EPA is expected to issue their final determination on lead impacts from aviation in 2023.

In the interim, General aviation (GA) stakeholders, including industry and government have agreed to the goal of, "eliminating the use of leaded aviation fuels for piston engine aircraft in the United States by the end of 2030 without adversely impacting the safe and efficient operation of the existing GA fleet" under the Eliminate Aviation Gasoline Lead Emissions (EAGLE) initiative.

Flight schools offer a great opportunity to help achieve the EAGLE goal, because they often use low compression, spark ignition, piston engine aircraft (referred to as piston aircraft throughout this document) that are, or can be, authorized to operate on unleaded aviation gasoline (referred to as UL avgas) that is currently available (i.e., UL94). In addition, flight schools often carry out high levels of activities near the airport (e.g., touch-and-go operations), which concentrates the area where emissions are released. Such concentrated emissions may extend more than a half mile from runway ends. Therefore, flight schools and those engaged in flight training make excellent partners in eliminating lead emissions at the source by switching to UL avgas in advance of the EAGLE commitment to transition to UL fuels by 2030, and in the process become a valued EAGLE partner.

Most flight schools in the U.S. do not control the sale of fuel, but rely on a Fixed Based Operator (FBO) or the airport operator to encourage the supply of UL avgas. Flight school operators are therefore encouraged to work with their airport operator, FBO, and/or fuel supplier to coordinate on the early transition to lead-free skies.

This document supports the EAGLE initiative by providing information and decision-making guidance to flight school operators on safely transitioning their avgas supply from 100 octane, low lead aviation gasoline (referred to as 100LL throughout this document) to an UL avgas. While this document may not cover all items that operators at an individual flight school may

[1] https://www.govinfo.gov/content/pkg/FR-2022-10-17/pdf/2022-22223.pdf

need to address, it provides guidance that may be helpful for flight school operators when initiating discussions on transitioning to UL avgas:

- Step 1: Check That Aircraft Are Authorized to Use UL Avgas,
- Step 2: Assess Flight School Infrastructure and Logistics, and
- Step 3: Deploy UL Avgas.

This guidance document also addresses four overarching considerations when transitioning to the use of UL avgas:

- Safety Protocols,
- Cost Considerations,
- Education and Training, and
- Coordination and Communication

Each of these steps and overarching considerations will help a flight school decide when to transition to UL fuels and will also guide the school through the transition process.

Background

There are approximately 220,000 piston aircraft registered in the U.S.[2] These aircraft serve many purposes including flight training, personal and recreational flying, agriculture use, firefighting, travel, etc. Piston aircraft are typically maintained to high standards and represent significant investments, resulting in their average age approaching fifty years.

Piston aircraft operate almost exclusively on 100LL due to various safety, technology, and economic reasons. 100LL contains lead at a rate of up to 2.12 grams per gallon as specified in ASTM D910[3], which is the industry consensus standard that specifies the composition, properties, and performance of 100LL and other grades of leaded avgas.

Although 100LL has been proven to be the safest fuel for the entire fleet of piston aircraft in operation today[4], there are environmental concerns about the consequential emissions of lead from piston aircraft. The EPA and the Centers for Disease Control (CDC) have stated that there is no known safe level of exposure to lead emissions, with children being particularly sensitive to its neurological and other toxic effects. EPA has banned lead additive from all other transportation fuels, with the transition to unleaded fuels beginning in the 1970s until a near complete ban on leaded transportation fuels in the mid-1990s, with the exception of leaded avgas.

EPA is developing a proposal under the Clean Air Act (CAA)[5] regarding whether lead emissions from piston aircraft cause or contribute to air pollution that may reasonably be anticipated to endanger public health or welfare. EPA issued this proposal in October 2022, which was open to public notice and comment until January 2023. After evaluating public comments, EPA plans to issue any final decision in 2023. A positive finding triggers a duty for EPA to propose and promulgate engine emission standards, and for FAA to regulate lead as a fuel component or fuel additive under statutory authority 49 U.S.C. 44714. Any subsequent regulatory action would involve EPA and FAA working together and carefully considering technology, safety, noise, and costs.

In the 2021 report “Options for Reducing Lead Emissions from Piston-Engine Aircraft”[6], the National Academies of Sciences, Engineering and Medicine recommended that the FAA and individual airport operators further promote the adoption of unleaded aviation fuels.

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[2] EAGLE Stakeholder Meeting, March 16-17, 2022, slide 46

[3] The ASTM (formerly known as the American Society for Testing and Materials), is an international standards organization that develops and publishes voluntary, consensus-based standards for a wide range of materials, products, systems, and services. ASTM specifications include those for avgas, such as ASTM D910 for leaded avgas and D7547 for unleaded avgas. Adoption of these standards by the industry help ensure that the composition and quality of avgas is maintained throughout the supply chain until avgas is dispensed into an aircraft.

[4] According to ASTM D910 and D7547

[5] https://www.epa.gov/laws-regulations/summary-clean-air-act

[6] https://nap.nationalacademies.org/catalog/26050/options-for-reducing-lead-emissions-from-piston-engine-aircraft

Therefore, this document was developed as part of the EAGLE initiative to support and provide guidance for flight schools to transition to UL avgas. There are many challenges in transitioning to an unleaded fuel supply, but the benefits of eliminating lead emissions are many. These benefits include eliminating the possibility of lead exposures to children, students, line service personnel, maintenance personnel, and others that either work at or reside near an airport. It also fosters reduced maintenance, the marketing of lead-free aircraft operations, and better community relations.

Overarching Considerations

As noted in the introduction of this document, EAGLE has identified three main steps and four overarching considerations to support the transition to UL avgas. These overarching considerations, outlined below, cover big-picture topics. Each consideration may fall under multiple steps, or may not be explicitly addressed within the steps themselves.

Safety Protocols	Cost Considerations	Education and Training	Coordination and Communication

Throughout this document, there are call-out boxes related to each of these considerations. These boxes may include comments, potential questions for discussions with the flight school stakeholder groups, and case study examples of real-world experiences in deploying UL avgas.

Safety Protocols

Safety is a paramount concern for the aviation sector and is a vital aspect of flight school operations. Flight school operators should address operational safety considerations in partnership with key stakeholders (e.g., fuel providers, flight instructors, etc.).

Mis-fueling refers to any time an incorrect fuel type (e.g., jet fuel versus avgas) or fuel grade (lower octane UL avgas versus 100LL) is delivered into an aircraft[7]. In the case of UL avgas, this would mean fueling an aircraft that is only authorized to fly on 100LL with UL avgas. Since currently available UL avgas cannot be safely used in all piston-powered aircraft, it is important to incorporate a safety plan into a flight school's transition to UL avgas. This is especially important when student pilots are conducting cross-country training flights and have to rely on their own judgement at unfamiliar airports, with unfamiliar fueling operations or lack of line service when operating self-service pumps.

To avoid mis-fueling, flight schools need to incorporate safety protocols and awareness into the flight school's training curriculum and guidance. These protocols and guidance should be developed in coordination with (at minimum) line service personnel, maintenance teams, flight and ground school instructors and student pilots, and include roles and responsibilities to avoid mis-fueling. Many training initiatives already exist that can be used to support the transition to UL avgas. More information is available in "Appendix 3 – Preventing Mis-fueling."

[7] EI Recommended Practice 1597 Procedures for overwing fuelling to ensure delivery of the correct fuel grade to an aircraft: https://publishing.energyinst.org/topics/aviation/aviation-fuel-handling/ei-recommended-practice-1597-procedures-for-overwing-fuelling-to-ensure-delivery-of-the-correct-fuel-grade-to-an-aircraft

In the interest of safety, and in line with the EAGLE initiative, airport operators that currently provide 100LL should continue to maintain a supply of 100LL avgas for any based or itinerant aircraft that are not authorized to use UL avgas, until a 100-octane UL avgas can be made available for those aircraft.

Discussion Points

- Does the flight school have aircraft that are not authorized to use the UL avgas? [8]
- Does the flight school share aircraft with other schools or for other purposes such as aircraft rental?

If so, coordinate with other aircraft users and educate them on the proper use and fueling requirements.

Case study – Preventing Mis-fueling

An airport that offers both 100LL and UL94 avgas at a self-serve pump reported that they added extra steps in the credit card point of sale system to ask the user three times whether they are sure that they want to purchase UL94 and to confirm that they are dispensing fuel to an aircraft authorized for UL94.

In addition, fueling systems that require authorized keys or cards to turn on UL avgas pumps could be used to prevent mis-fueling.

Cost Considerations

The overall cost for transitioning a flight school's fleet to unleaded fuel depends on many elements. It is important to coordinate with stakeholders throughout the decision-making process, to understand the impacts of various costs. Important areas to consider include, but are not limited to, fuel storage and distribution costs, fuel costs, supplemental type certificate (STC) costs, and maintenance costs.

See the "Cost Considerations" boxes throughout this document for more information.

[8] Maintaining 100LL availability for all aircraft that need it through 2030 is consistent with the EAGLE goal. Additionally, it is important to note that a ban on the sale or use of 100LL at a federally obligated airport is inconsistent with Grant Assurance 22(a), Economic Non-Discrimination (49 U.S.C. 47107(a)(1)1) and conflicts with the self-service provision of this grant assurance.

Education and Training

As noted throughout this document, training and education are a vital part of the UL avgas transition process. Some of the key elements to include in education and training activities are:

- Applicable Occupational Safety and Health Administration (OSHA) and state or local health and safety education and training requirements,
- Mis-fueling prevention and best practices,
- Benefits of UL avgas use, and
- Changes in maintenance related to UL avgas use.

Some valuable resources to support the transition to UL avgas, including education and training elements are:

- The EAGLE website,[9]
- STC Holder websites,[10]
- Type Certificate holder information websites on UL avgas use,[11]
- Fuel Producer websites,
- NATA Mis-fueling Prevention Program,[12] and
- Energy Institute.[13]

As noted in the "Safety Protocols" section above, many training initiatives already exist that can be used to support the transition to UL avgas. It is up to the flight school's best practices on how to incorporate these resources into the flight training curriculum, maintenance program, etc., so that all relevant parties have access to the information that they need. These relevant parties may include:

- Maintenance teams,
- Flight line managers,
- Flight instructors and ground instructors,
- Student pilots, and
- Others, as noted in Appendix 2 – Roles and Responsibilities in Transitioning a Flight School to UL Avgas.

Assess any education and training program developed to help the school transition to UL avgas for relevance as a part of an ongoing or recurrent training plan. For example, training on mis-fueling prevention could be incorporated into the maintenance team's annual training program.

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[9] https://www.FlyEAGLE.org

[10] Fuel STC Holder websites – Swift: https://www.swiftfuelsavgas.com
GAMI: https://www.g100ul.com/

[11] Link to Type Certificate Data Sheets (TCDSs) for engine and aircraft, which have information on what types of fuel are allowed. This would not include STC fuel information as this is independent of the aircraft and engine manufacturer.
https://drs.faa.gov/browse/TCDSMODEL/doctypeDetails

[12] https://www.nata.aero/education-and-training/misfueling-prevention-program

[13] https://publishing.energyinst.org/topics/aviation/aviation-fuel-handling/ei-recommended-practice-1597-procedures-for-overwing-fuelling-to-ensure-delivery-of-the-correct-fuel-grade-to-an-aircraft

Case study – Incorporating UL avgas discussions into flight training

In August 2022, the University of North Dakota (UND) announced that the avgas supply for their entire flight school will soon be switched from 100LL to UL94.[14]

To prepare for the transition, UND incorporated information from Swift Fuels (the UL94 producer) into a briefing for all their line service personnel. As the transition date becomes more certain, this training briefing will be repeated for all staff. The briefing supplemented ongoing training utilized by the school, such as National Fire Prevention Association 407,[15] FAA Advisory Circular AC 150/5230-4C,[16] and NATA Safety 1st Training Certification.[17]

Similarly, all Certified Flight Instructors (CFIs) at the flight school received a training briefing, which will be repeated when the transition date becomes more certain. Due to the lack of dye in UL94 as of early 2023, fuel samples were presented to the CFIs, including samples of:

- 100LL,
- UL94,
- Mixed blends of:
    - 25% UL94 / 75% 100LL,
    - 50% UL 94 / 50% 100LL,
    - 75% UL 94 / 25% 100LL,
- UL94 mixed with water, and
- UL94 mixed with Jet-A.

Digital photos of these blends were created for inclusion in teaching materials, and the samples have been made available for presentation in the classroom.

Once the flight school has transitioned to UL94, they will continue to provide briefings and training aids, and will continue ongoing safety risk assessment meetings.

[14] https://blogs.und.edu/und-today/2022/07/und-aerospace-getting-the-lead-out/
[15] National Fire Prevention Association 407: Standard for Aircraft Fuel Servicing, https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=407
[16] AC 150/5230-4C - Aircraft Fuel Storage, Handling, and Dispensing on Airports, https://www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentnumber/150_5230-4
[17] https://www.nata.aero/education-and-training/safety-1st

Coordination and Communication

Communication is critical throughout a school's entire transition to UL avgas. The table below provides an overview of the stakeholders that could play a role in the transition to UL avgas, and the steps that may be most relevant for them, while the "Discussion Points" boxes throughout this document provide examples of topics that may need to be addressed in the transition process.

Role	Step 1: Check That Aircraft Are Authorized to Use UL Avgas	Step 2: Assess Flight School Infrastructure and Logistics	Step 3: Deploy UL Avgas
Maintenance Team	X	X	X
Flight Line Manager	X	X	X
Line service personnel	X		X
Airport Operator (If applicable)		X	X
FBO Operator (If applicable)	X		X
Fuel Producer / Provider		X	X

"Appendix 2 – Roles and Responsibilities in Transitioning a Flight School to UL Avgas" provides additional details about the stakeholders that may need to be involved, along with examples of the types of discussions that may be relevant to have with those stakeholders.

Step 1: Check That Aircraft Are Authorized to Use UL Avgas

About 70% of the U.S. piston powered aircraft fleet can operate safely with UL94 avgas, and many aircraft at flight schools may already be authorized to run on ASTM UL91, UL94 and other grades of UL avgas. However, unleaded grades of fuel are generally not yet widely available in the avgas market.

Source: https://www.aopa.org/go-fly/aircraft-and-ownership/aircraft-guide/aircraft/cessna-172

For parties interested in deploying UL avgas, the first step is checking whether the aircraft and engines are authorized to use UL avgas. EAGLE has identified four main actions relevant to this step:

A. Identify aircraft already authorized to use UL avgas,
B. Obtain Supplemental Type Certificates (STCs) or other approvals, i.e. fleet authorization, for aircraft not already authorized to use UL avgas,
C. Consider maintenance impacts of UL avgas, and
D. Maintain provisions for 100LL for aircraft not authorized for UL avgas, .

A. Identify aircraft already authorized to use UL avgas

The first step in determining whether a flight school's aircraft is authorized to use UL avgas is to collect information about the entire fleet of aircraft that the flight school owns or operates.

For each tail number, it is important to know both:

- The aircraft type and
- The engine type.

Then check:

- The Pilot Operating Handbook (POH),
- Aircraft Flight Manual (AFM), and
- TCDS[18] of each aircraft and engine.

These documents provide details on whether the aircraft and engine are approved or authorized to use unleaded fuels and the minimum fuel grade with which the aircraft and engine can safely operate.

If the POH, AFM and TCDS do not list any unleaded fuels as being approved or authorized for an aircraft, then you should contact the manufacturer to see if the aircraft may be eligible to use a FAA Fleet Authorization[19] for a specific unleaded fuel. The aircraft may also be eligible to use a FAA approved STC[20] unleaded fuel. The aircraft owner or operator will have to take appropriate action, such as placard installation, before using a FAA approved STC fuel or a FAA Fleet Authorized fuel.

Placarding for Mis-fueling Prevention

Training and procedures must be in place to ensure that aircraft are not mis-fueled with lower octane, unleaded grades of fuel or any other grades of fuel that are not compatible or otherwise authorized for said aircraft and engine combination.

Aircraft are required to be placarded with the authorized fuel grades required for safe operation. Fuel systems must be labeled with the type of fuel that they dispense.

Refer to the "Safety Protocols" section of this document and "Appendix 3 – Preventing Mis-fueling" for more information on mis-fueling prevention.

[18] https://drs.faa.gov/browse/TCDSMODEL/doctypeDetails
[19] The Fleet Authorization process is one method FAA can use to authorize the use of a fuel in an aircraft or engine. It was developed to use the authority granted by Congress (FAA Reauthorization Act of 2018, Section 565(a)(3)).
[20] Fuel STC Holder websites – Swift: https://www.swiftfuelsavgas.com
GAMI: https://www.g100ul.com/

B. Obtain Supplemental Type Certificates (STCs) or other approvals, i.e. fleet authorization, for aircraft not already authorized to use UL avgas

FAA has awarded STCs to Swift and GAMI for unleaded fuels that have been independently developed and tested.[21] The STCs for unleaded fuels include additional requirements, such as those found in Lycoming Service Instruction 1070S[22] and Textron Service Bulletin SEB-28-04[23], which specify oil grades, oil additives, maintenance intervals, and other limitations when using unleaded fuels.

In addition, STC approvals may have Flight Manual Supplement(s) denoting specific operational changes required when using an STC for an authorized UL avgas. STCs may also have Instructions for Continued Airworthiness (ICA), which may impact maintenance schedules.

The FAA published a Policy Statement PS-AIR-600-20-01 on March 30, 2023 entitled "Enabling the Use of Unleaded Aviation Gasoline in Piston Engine Aircraft and Aircraft Engines through the Piston Aviation Fuels Initiative (PAFI) Fleet Authorization Process".[24],[25] This policy statement is available on the FAA Dynamic Regulatory System (DRS)[26] and describes the fleet authorization process in detail. Fleet Authorization for UL91 is expected in 2023.

Aircraft owners and operators such as flight schools wishing to use unleaded fuel, are responsible for reviewing the relevant documents, determining their aircraft's eligibility, and then taking the appropriate steps to allow the use of either a STC unleaded fuel or Fleet Authorized unleaded fuel. The FAA Unleaded Fuel Development Frequently Asked Questions[27] may provide additional helpful information.

[21] FAA Approved Model List (AML) No SA01967WI:
https://drs.faa.gov/browse/excelExternalWindow/CB1F1A44F4ECE9E7862588BC004C5EBB.0002%3FmodalOpened%3Dtrue
GAMI G100UL Engine AML STC:
https://drs.faa.gov/browse/excelExternalWindow/E5BFA15295715137862588C60049B9AA.0002?modalOpened=true
[22] https://www.lycoming.com/sites/default/files/SI1070AB%20Specified%20Fuels.pdf
[23] https://support.cessna.com/custsupt/contacts/pubs/ourpdf.pdf?as_id=54042
[24] https://drs.faa.gov/search?modalOpened=true
[25] https://www.faa.gov/about/initiatives/avgas#pafi
[26] https://drs.faa.gov/search?modalOpened=true
[27] https://www.faa.gov/sites/faa.gov/files/FAQs_FAA_UL_Fuel_Development.pdf

STC Costs

The cost of purchasing, shipping, and installing an STC can vary. Typically, a STC may be purchased directly from the STC holder (e.g., UL avgas producer).

Along with the purchase of an STC, install applicable placards for the authorized aircraft listed. More information about placards can be found in the “Placarding” section of this document.

An Airframe and Powerplant (A&P) mechanic, or an equivalently authorized person, will be required to complete Form FAA 337 – Major Repair & Alteration (Airframe, Powerplant, Propeller, or Appliance), and install the fuel placard on the authorized aircraft. Check 14 CFR Part 43 for the need of a FAA Inspector Authorized (IA) Designee.

Case study – Santa Monica Municipal Airport (SMO)

In 2022, Santa Monica Airport deployed UL94, including to the airport’s flight schools. Santa Monica assessed the fleet based at the airport and determined that a significant proportion of the piston aircraft based at the airport can safely operate on commercially-available UL avgas. As a result, Santa Monica Airport decided to subsidize the costs that its flight schools and its based pilot community would have incurred to transition their aircraft to this fuel (i.e., placarding costs).

Santa Monica attributes the success in this transition to the ability to subsidize costs, and encourages airports that are unable to provide such a subsidy to investigate other means to financially enable the supply of UL avgas.

C. Consider maintenance impacts of UL avgas

Understanding fleet compatibility with UL avgas includes an evaluation of UL avgas impacts on aircraft maintenance needs. Transitioning an aircraft to unleaded fuel may have positive impacts on the aircraft engine's overall maintenance needs. For example, without lead in the fuel, an engine may not experience similar deposit build-up.

To ensure safety, flight school maintenance A&Ps and A&Ps with Inspection Authorization (IA) will need to perform all required engine maintenance. In some cases, the maintenance schedule may need to be amended in response to the aircraft's use of UL avgas. For example, Lycoming Service Letter No. 270 authorizes "Extended Maintenance Intervals for Spark-Ignited Engines Operated on Unleaded Fuels"[28] and identifies maintenance intervals, oil requirements, and other important stipulations and procedures for the transition from leaded to UL avgas. Likewise, contact other manufacturers to identify their specific requirements for operation and transition to UL avgas.

Case study – Maintenance Timing

A flight school operator contacted during the process of developing this document noted that, while using UL avgas, they were able to reduce their engine maintenance times from every 2000 hours to every 2200 hours according to the manufacturer's service information on the use of UL avgas.

Case study – Timing of Notable Benefits from UL avgas

A flight school operator contacted during the process of developing this document noted that in order to see notable benefits of using UL avgas, they found that the engine needs to run exclusively on UL avgas for over 100 hours.

Therefore, if an aircraft that is run on UL avgas goes for a long-distance flight and refuels elsewhere on 100LL, the 100-hour clock restarts before the maintenance team will see notable benefits for the engine.

28 https://www.lycoming.com/sites/default/files/SL270%20Extended%20Maintenance%20Intervals%20for%20%20Engines%20Operated%20on%20Unleaded%20Fuels_0.pdf

Case study – Monitoring Maintenance Interval Impacts

In August 2022, UND announced that the avgas supply for their entire flight school will soon be switched from 100LL to UL94.[29]

In preparation for this transition, the UND maintenance team started taking oil samples on 5 Piper Archers within their fleet, to establish baseline oil lead levels before switching to UL94. Once the flight school converts to 94UL, they will continue to take oil samples and will chart the results to determine if the UL94 analysis reports show improvement, deterioration, or no change.

Additionally, once the school transitions to UL94, the UND maintenance team plans on increasing the phase inspection intervals on their aircraft by 25%. This will result in engine oil change intervals increasing from 60 hours + or – 10 hours to 75 hours + or – 10 hours. Based on 2021 data, this will result in 277 fewer phase inspections.

Case study – Maintenance Costs

Using UL avgas may have long-term benefits for aircraft engines. Aircraft engines benefit from the removal of lead from the avgas, which can reduce overall maintenance costs. Any changes in a flight school's FAA-approved maintenance manual activities needs to be coordinated with and approved by the local FAA Principal Maintenance Inspector (PMI).

A small flight school operator contacted during the process of developing this document noted that the reduction in maintenance costs would likely be relatively small on a per aircraft basis. However, the benefits of reduced maintenance costs were determined to be more meaningful with respect to the overall operating budget when all aircrafts were included.

[29] https://blogs.und.edu/und-today/2022/07/und-aerospace-getting-the-lead-out/

D. Maintain provisions for 100LL for aircraft not authorized for UL avgas, until a high-octane UL avgas is available

As noted in the "Safety Protocols" section above, and in line with the EAGLE goals, the transition to a lead-free future will be gradual. Until a high-octane UL avgas is available, maintaining continued and consistent supply of 100LL avgas for high compression spark-ignition piston aircraft that are not authorized to use lower octane UL avgas will be vital for the success of this transition. Catastrophic engine failure is highly likely if a lower octane grade is used in aircraft that require 100-octane.

If these types of aircraft operate at the flight school (as either based or itinerant aircraft), coordinate with the airport or FBO so that 100LL remains available for these aircraft.[30]

It is anticipated that a 100-grade, UL avgas may be authorized and brought to market for such aircraft by 2030 through EAGLE, the PAFI program, FAA authorized STCs or others.

Discussion Points

The actions that a flight school may need to take to ensure the availability of 100LL will depend on multiple factors including but are not limited to:

- Does the flight school operate the fueling operation at a public use airport?
- Does to the flight school operate a variety of low and high compression aircraft?
- Does the flight school operate restricted, limited or other type of experimental aircraft?

Please see "Step 2: Assess Flight School Infrastructure and Logistics" for more information.

[30] As noted in the "Safety Protocols" section above, maintaining 100LL availability for all aircraft that need it through 2030 is consistent with the EAGLE goal. Additionally, it is important to note that a ban on the sale or use of 100LL at a federally obligated airport is inconsistent with Grant Assurance 22(a), Economic Non-Discrimination (49 U.S.C. 47107(a)(1)1) and conflicts with the self-service provision of this grant assurance.

Step 2: Assess Flight School Infrastructure and Logistics

The types of infrastructure and logistics questions relevant to a flight school will depend on many factors. For example, flight schools that rely on the airport's or an FBO's fuel farm are encouraged to discuss options for transitioning to UL avgas with the airport operator or FBO, while larger flight schools that operate their own fuel farms can coordinate directly with the fuel producers and providers.

Source: https://www.kitplanes.com/future-fuels/

EAGLE has identified three main actions to consider related to infrastructure and logistics:

A. Investigate UL avgas availability,
B. Review fuel storage facilities and distribution procedures used by the flight school, and
C. Estimate total annual volume of UL avgas needed, in coordination with the airport and/or FBO.

A. Investigate UL avgas availability

As of May 2023, Swift UL94 and automotive fuels without ethanol[31] are the only FAA authorized and commercially available unleaded fuels for piston aircraft. These fuels are available in the U.S. on a limited, local or regional basis. These fuels may only be used in aircraft that have these specific fuels listed in their AFMs, POHs, type certificates or supplemental type certificates (STCs) as discussed in Step 1: Check That Aircraft Are Authorized to Use UL Avgas. It is anticipated that these fuels will become more available in local markets where demand rises, and supply chains become established.

Multiple sources may provide a list of all UL avgas available for use in some or all aircraft[32] and flight schools, along with their airports and FBOs as appropriate, are encouraged to investigate whether UL avgas is already being distributed at other airports nearby the flight school. Having existing UL avgas distribution nearby can facilitate UL avgas distribution and may reduce costs for fuel delivery.

Once a flight school transitions to UL avgas, being aware of nearby UL avgas availability is also critical to flight school operators and student pilots. Before flight, pilots should contact destination airports directly to determine UL avgas availability and any specific guidance or requirements for UL fueling.

An EAGLE objective is to facilitate widespread availability of UL avgas options in the near future that are fungible with 100LL and do not require separate infrastructure. The industry and FAA have committed to being lead free by the end of 2030 without impacting the safe and efficient operation of the existing GA Fleet.[33]

Fuel Cost Considerations

The cost of UL avgas is dependent upon on many factors, which may include the following:

- Fuel volume: It is typically more cost effective to purchase fuel in large volumes.
- Airport location: The airport distance from current fueling infrastructure can influence transportation costs associated with the fuel purchase.
- Market conditions: Just as with other fuel types, the overall cost of UL avgas will fluctuate with the market.

Please contact the fuel producer or distributor for information about the specific cost of delivering UL avgas to the facility.

[31] For more information on automotive gasoline without ethanol:
https://www.autofuelstc.com/
https://www.eaa.org/eaa/pilots/eaa-stc-program/auto-fuel-stc
https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_23_1521-1B.pdf
[32] https://flyeagle.org
[33] https://www.faa.gov/unleaded

B. Review fuel storage facilities and distribution procedures used by the flight school

A flight school's transition to UL avgas is dependent upon the fuel storage facilities that exist or are required to accommodate UL avgas. Each of these scenarios are outlined in the table below, along with considerations to enable the flight school's transition to UL avgas.

Source: EAGLE presentation 3/25/2022

Flight School	Option 1	Option 2	Considerations
- Owns or leases one storage tank system - No 100LL aircraft	One system UL avgas	Second system not needed or funding not possible	- Minimal cost - 100LL not needed and not provided
Owns or leases one storage tank system - Has 100LL aircraft	One system UL avgas	Install second system for 100LL	- New system cost - 100LL provided for base or transient aircraft
Owns or leases two storage tank systems	One system 100LL and one UL94	Two UL94 systems	- Minimal cost - 100LL, if needed - Flexibility for future fuels (a 100 grade, UL avgas)
Purchases fuel from a separate entity, such as an FBO or Airport	One system	Two systems	- Requires coordination with the fuel system owner/operator and other airport and fuel stakeholders

UL avgas producers will be able to provide detailed actions required to transition from 100LL to UL avgas[34]. For example, the purging and cleaning of fuel storage tanks when transitioning from a higher grade of fuel to a lower grade of fuel may not always be required, but is considered a good management practice, and fuel vendors can readily provide these services. A general overview of the fuel storage tank transition process is contained in "Appendix 4 – Switching Fuel Tanks from 100LL to UL Avgas."

[34] Note on comingling UL94 with 100LL in aircraft fuel tanks: Since UL94 avgas is chemically the same as 100LL (but without tetraethyl lead); these fuels can be comingled in any aircraft that is approved for use of UL94 as specified by FAA SAIB HQ-16-05R1.

Mis-fueling Safety Consideration

The introduction of any new fuel or fuel grade requires the implementation of mis-fueling prevention procedures. These procedures are put in place so any aircraft that are only approved for 100LL are not mis-fueled with unleaded fuels. These procedures are implemented at each stage throughout the supply and distribution system. Procedures for the prevention of mis-fueling need to address all aircraft that are fueled at the airport.

See the “Safety Protocols” section, “Appendix 3 – Preventing Mis-fueling”, and National Air Transportation Association (NATA) White Paper: Unleaded Avgas Conversion Considerations for Aviation Fuel Providers[35] for more information.

Placarding

Clear and detailed placarding will help to facilitate situational awareness of fuel types on the airport. Properly placard every fuel tank, whether for storage, distribution, or at an aircraft filler neck with a clear identification of fuel grade.

See the “Safety Protocols” section and “Appendix 3 – Preventing Mis-fueling” for more information.

[35] https://www.nata.aero/assets/Site_18/files/EAGLE/NATAUnleadedAvgasConsiderations.pdf

i. If a flight school purchases fuel from a separate entity (i.e., airport or FBO), that entity has a single 100LL fuel tank, and converting that tank to UL avgas adversely affects availability of 100LL

If a flight school is not the owner of the fuel tank, they will need to discuss the transition to UL avgas with the owner of the fuel farm (i.e., airport or FBO). Meet with the airport operator and FBO(s), as appropriate, to determine whether it would be possible or reasonable to:

- Add a fuel tank for UL avgas, or
- If the primary users can use UL avgas, switch the existing tank from 100LL to UL avgas, and provide a smaller tank or truck of 100LL for aircraft that are not authorized for UL avgas, until a high-octane UL avgas is available.

This will depend on the aircraft and engine combinations that operate at the airport, including the demand from transient aircraft.

If the location has only one fuel storage tank, and the decision has been made to switch the tank to UL avgas but a light demand remains for 100LL, a small truck or tender, or a small tank may suffice (e.g., ConVault or FuelCube) in providing continued 100LL availability.

Fuel Storage Cost Considerations

Aviation fuel tank systems and refueling equipment costs vary considerably, depending on volume, location and other factors. For example, a 1,000-gallon capacity, mobile fuel bowser may cost less than a commercially installed, aviation fuel storage tank of 10,000 gallons or more, neither of which are uncommon at airport facilities, depending on fuel sales volume. Therefore, an assessment of fuel demand by type will be critical to determine capital and operating costs.

ii. If a flight school purchases fuel through a separate entity (i.e., airport or FBO), and converting one 100LL tank to UL avgas does not adversely affect availability of 100LL

In this scenario, a flight school may immediately meet with the airport and FBO, as well as other local users to determine when it may be possible or reasonable to switch one tank from 100LL to UL avgas.

This will depend on the total demand for all fuels for the types of aircraft and engine combinations for both based and transient traffic at the airport.

Case study – Centennial Airport (APA)

In 2023, Centennial Airport deployed UL94, including to the airport's flight schools. The airport encouraged this deployment in a few ways:

- Coordinated with the airport's three largest flight schools to make sure that the schools obtained STCs for their eligible aircraft,
- Coordinated with Jet Centers of Colorado to transition one of their fuel farm tanks and a fuel truck for UL94 use,
- Agreed to provide subsidies through 2023, as needed, to price-match UL94 with the cost of 100LL, and
- Will continue to sell 100LL until an unleaded replacement is widely available.

iii. If a flight school privately owns or leases one or more fuel tanks

It may be feasible for a flight school to transition to currently available UL avgas, provided that 100LL remains available until UL avgas is widely available.

Based on the number of aircraft at the flight school able to operate on UL avgas, determine annual and seasonal fueling needs (e.g., volume, frequency) and coordinate directly with a UL avgas producer.

If aircraft in the school's fleet are unable to operate on currently available UL avgas, ensure that 100LL remains available for those aircraft through other options at the airport and that appropriate mis-fueling prevention procedures are in place.

Case study – Utilizing Fueling Infrastructure to Enable UL Avgas Deployment

In August 2022, UND announced that the avgas supply for their entire flight school will soon be switched from 100LL to UL94.[36]

UND's fueling facilities play a key role in enabling this transition. UND has two dedicated fuel tanks at Grand Forks International Airport (GFK), separate from the tanks used by others at the airport. The school also owns their own fuel trucks and employs their own line personnel. These arrangements allow UND and GFK to reduce the risk of potential mis-fueling issues, while GFK is able to continue supplying 100LL for other based and transient aircraft.

[36] https://blogs.und.edu/und-today/2022/07/und-aerospace-getting-the-lead-out/

Discussion Points

Who bears the cost to transition to UL avgas (e.g., STC costs, placarding costs, fuel costs, fuel storage costs)?

- FBO(s)
- Airport
- Students
- Other flight schools at the airport

What avenues exist to fund the transition to UL avgas?

- State incentive programs
- Grant opportunities
- University programs

If a flight school is a part of a university program:

- How will a capital spend be justified?
- What will be key drivers to convince a positive budget allocation?

If students pay for fuel directly:

- Will students at the flight school be willing to pay additional fees in order to train in a lead-free environment?

Case study – Port of Portland, Hillsboro Airport (HIO)

- Exploring opportunities to encourage voluntary adoption of FAA-approved unleaded fuel at a cost that is competitive with leaded avgas
- Offering an existing underground storage tank (UST) to the first interested FBO that wants to be the initial retail vendor for unleaded fuel at HIO
- Collaborating with other airports that offer UL94 on lessons learned

Source: EAGLE Stakeholder Meeting, June 23, 2022

Case study – City of San Diego, Montgomery Gibbs-Executive Airport (MYF)

- Pursuing new fuel infrastructure to adopt UL94
- Includes 10,000+ gallon tank for “assisted self-serve” on main ramp
- Council approved budget for new tank
- Initiating development process (Planning / Design / Environmental / Construction)
- Working with other airports and industry organizations (SWAAAE, NATA, AOPA, etc.) to increase unleaded fuel availability in the region

Source: EAGLE Stakeholder Meeting, June 23, 2022

C. Estimate total annual volume of UL avgas needed, in coordination with the airport and/or FBO

Begin by collecting fuel consumption data (e.g., for the previous five years). It is also useful to understand how the volumes fluctuate (e.g., annually, summer-winter seasonal operations, or by semester or quarter if the flight school is operated by a university).

It will also be important to include anticipated growth or decline in the coming years based on anticipated demand from new entrants. UL avgas fuel providers will also need this historical information to provide cost estimates upon which the school can base capital decisions.

Discussion Points

How will a flight school address:

- UL avgas order lead time,
- Delivery schedules,
- Split loads, and
- Any potential differences in available volumes or possible supply chain issues with UL avgas deliveries?

Step 3: Deploy UL Avgas

Once a flight school has identified and addressed the unique factors of the school's aircraft and, engines as well as the fuel infrastructure and logistics, it is time to address any remaining overarching considerations. Review the call-out boxes in this document related to "overarching considerations" to address issues as safety protocols, cost considerations, education and training, coordination and communication, and any other discussion points.

Once addressed, these will help a flight school determine when they can transition to UL avgas. The flight school operator can start the process by working directly with a fuel provider, airport, or FBO, or all the above as applicable, and develop a fuel purchase contract, memorandum of understanding (MOU) or other agreement, if relevant.

If a contract or MOU is used, it may be useful to establish:

- A date by which the flight school is ready to accept the UL avgas,
- The volume of UL avgas needed, and
- Any other instructions for a timely delivery.

When the flight school has safely and successfully deployed UL avgas, it will be part of the broader transition away from leaded avgas, and it becomes a valued EAGLE partner in creating a lead-free future.

Please contact info@flyeagle.org if your flight school is interested in sharing feedback on this document, or in being included as a case study.

Appendix 1 – Example Checklist of Actions to Prepare for a Transition to UL Avgas

The checklist below provides examples of the actions discussed throughout this document in a format that a flight school can use to track progress towards the deployment of UL avgas. This list is not exhaustive but provides examples of actions that may be relevant while transitioning to the use of UL avgas.

Action	Action leader	In coordination with	Status	Completion date
Identify fleet eligibility for using UL avgas				
Identify storage infrastructure (e.g., fuel tanks, fuel trucks)				
Identify potential throughput for UL (e.g., quantities, delivery schedules)				
Preliminary/exploratory discussion with fuel provider on costs, logistics, requirements, etc.				
Internal preliminary estimate of all potential costs (e.g., infrastructure, training, cost/gal)				
Initiate a Safety Management System (SMS) review process for transitioning to UL avgas				
Coordinate with airport, fuel provider, and maintenance technicians on needs for placarding and other signage and labeling				
Explore funding opportunities in coordination with the airport				
Coordinate any updates needed to training curriculums (including the flight school curriculum, as well as maintenance and fuel handler training)				

Action	Action leader	In coordination with	Status	Completion date
Obtain a commitment from the fuel provider and sign a fuel purchase contract or Memorandum of Understanding				
Initiate any new training or safety procedures prior to the deployment of UL avgas at the facility				
Identify and document important details of the transition process for future programs, including program requirements, fleet use impacts, barriers and solutions, emissions impacts, briefings, market dynamics, etc.				
Develop outreach and communications materials to share information regarding the flight school's transition to UL avgas (e.g., brochures, social media posts, presentations)				
Finalize any terms in the fueling contract, ensuring no disruption to student flight schedules				
Accept the school's first delivery of UL avgas				

Appendix 2 – Roles and Responsibilities in Transitioning a Flight School to UL Avgas

Table 1 provides an overview of types of roles that may be involved in the transition process.

Table 2 provides additional guidance on which sections of this document are most relevant, based on a person's role in the flight school.

Table 1 - Roles in a Flight School Transition to UL Avgas

Line service personnel	If the school has dedicated line service personnel at the facility, then training and communication with them is vital to avoid mis-fueling incidents. Work with the teams to develop appropriate procedures. The flight school can also provide information on the benefits of switching to UL avgas. If the school does not have dedicated line service personnel, then provide training to anyone who may refuel an aircraft at the facility to avoid mis-fueling incidents. Free training from NATA is available at www.PreventMisfueling.com.
Maintenance teams	Make the maintenance teams that service the flight school's aircraft aware of any changes in fuel type(s) used within the school's aircraft. Coordinate with maintenance teams on appropriate placarding for all aircraft and how changes in fuel use may impact aircraft maintenance schedules. The flight school can also provide information on the benefits of switching to UL avgas. Maintenance teams may be able to help develop cost estimates for how switching to UL avgas could impact overall maintenance costs.
Flight instructors and ground school instructors	Instructors will play a vital role in ensuring that the students are aware of any changes in fueling procedures and to help avoid mis-fueling incidents. Work with flight instructors to develop a robust training plan for students, including any new safety measures that may be implemented at the facility. Free mis-fueling prevention training is available from NATA at www.PreventMisfueling.com and the Energy Institute (e.g. EI 1597).
Students	Brief students on the transition to UL avgas, any safety procedures that the facility has put in place, and the benefits of switching to UL avgas. Student training will be particularly important if there will be more than one fuel type available at the facility as a result of the transition. Free mis-fueling prevention training is available from NATA at www.PreventMisfueling.com.

Other faculty and staff	If the flight school is university-based, inform all faculty and staff of the flight school's transition to UL avgas, especially those who are involved in training or outreach programs. Have consistent messaging throughout the campus to improve situational awareness of all faculty and staff members. Depending on the school, it may also be necessary to coordinate with the school board and other departments of the school (e.g., financial offices regarding funding opportunities, communications offices regarding promotional material for broadcasting the school's use of UL avgas).
Airport	Coordinate with the airport where the flight school is based regarding a transition to UL avgas. The airport should be able to provide information about other operations at the facility, including itinerant operations. The airport would be the main point of contact with FAA for any discussions regarding resource needs. While existing UL avgas on the market (as of early 2023) are identical (as far as flammability) to 100LL without the lead additive, coordinate with the airport fire department so that they are aware of the change in fuel types available at the airport.
Fuel provider	If the facility has a dedicated contract with a fuel provider, coordinate with them on whether they can provide UL avgas. If so, they will provide cost information based on the fuel volumes, the facility's location, and other factors that may impact fuel costs. Coordinate with the fuel provider regarding consistency in the fuel supply and to avoid any disruptions in fuel deliveries.
Insurance companies	Coordinate with the flight school's insurance company so that they are aware of the change in fuel types available at the airport. There may be changes needed to the flight school's insurance policies, based on the changes that will be made to the operations as a result of changing the fuels available at the facility.
Nearby airports	Inform other nearby airports of the flight school's transition to UL avgas, so that they may appropriately inform their based operators of changes in nearby fuel availability.
Surrounding communities	Consider communicating the flight school's transition to UL avgas with the communities surrounding the facility, including points about health and environmental benefits. This type of communication is particularly important if the flight school is implementing this transition in response to concerns from nearby communities.
Parents	If minors participate in the flight training program, inform their parents of any relevant changes being implemented by the flight school, including details on the safety procedures in place and the benefits of using UL avgas.

Table 2 - Roles Associated with Each Step of the Transition to UL Avgas

	Step 1: Check That Aircraft Are Authorized to Use UL Avgas				**Step 2: Assess Flight School Infrastructure and Logistics**			**Step 3: Deploy UL Avgas**
Role	A. Identify aircraft already authorized to use UL avgas	B. Obtain Supplemental Type Certificates (STCs) or other approvals, i.e. fleet authorization, for aircraft not already authorized to use UL avgas	C. Consider maintenance impacts of UL avgas	D. Maintain provisions for 100LL for aircraft not authorized for UL avgas, until a high-octane UL avgas is available	A. Investigate UL avgas availability	B. Review fuel storage facilities and distribution procedures used by the flight school	C. Estimate total annual volume of UL avgas needed, in coordination with the airport and/or FBO	
Maintenance Team	X	X	X	X	X	X	X	X
Flight Line Manager	X	X	X	X	X	X	X	X
Line service personnel				X		X	X	X
Airport Operator (If applicable)				X		X	X	X
FBO Operator (If applicable)	X	X		X		X	X	X
Fuel Producer / Provider					X	X		X

Appendix 3 – Preventing Mis-fueling

Line service personnel

Make line service personnel, including the fuel supply company and their delivery teams, aware of any changes to the fuel supply at a facility to make sure that the correct type and grade of fuel is received into each fuel storage tank. If the airport has fuel trucks that deliver fuel to aircraft on the ramp or provides "full service" refueling from fixed refueling equipment, those line service personnel will also need to be trained on mis-fueling prevention procedures. Communication between pilots and line service personnel is critical to mis-fueling prevention. Train pilots on how to communicate proper fuel orders, which include three key components:

- The type and grade of fuel,
- The volume of fuel to be delivered into each tank, and
- The aircraft registration (tail) number.

Maintenance teams

Make maintenance teams aware of the switch in fuel use so that each aircraft is receiving proper attention based on each aircraft's fuel needs. For more information, see the "Safety Protocols" section of this document.

Flight and ground school instructors

The flight instructors and ground school instructors will need to make all flight training students aware of the differences between 100LL and UL avgas, and the critical nature of communicating proper fuel orders. More information on this is included in the "

Education and Training" section of this document.

Tips to avoid mis-fueling

Incorporate the "Two of Three Rule" in any refueling procedures.[37], [38] The "Two of Three Rule" requires that two of the three controls listed below must be in place for every refueling, with no exceptions. If not, the aircraft must not be refueled:

- Confirmed filler port placards,
- Corresponding spouts and filler ports[39], and/or
- A signed fuel grade confirmation form.

[37] NATA General Aviation Misfueling Prevention Online Program, https://www.nata.aero/education-and-training/misfueling-prevention-program.aspx; www.preventmisfueling.com

[38] EI Recommended Practice 1597 Procedures for overwing fuelling to ensure delivery of the correct fuel grade to an aircraft, https://publishing.energyinst.org/topics/aviation/aviation-fuel-handling/ei-recommended-practice-1597-procedures-for-overwing-fuelling-to-ensure-delivery-of-the-correct-fuel-grade-to-an-aircraft

[39] It is critical to note that there is no grade selectivity amongst avgas nozzle spouts or filler ports. UL94 avgas filler spouts correspond to the filler ports of aircraft that require a 100-Octane Avgas. For more information visit: www.preventmisfueling.com.

Appendix 4 – Switching Fuel Tanks from 100LL to UL Avgas

The general procedure for switching a tank from 100LL to UL avgas includes several actions[40]:

- Remove as much of the 100LL from the fuel storage tank(s) and mobile refuelers as possible.[41]
    - ASTM specifications for UL Avgas allow for a maximum of 0.0130 g Pb/l of Tetraethyl lead. This equates to no more than 2% of the tanks capacity in 100LL when UL avgas is added.[42]
- Work with the airport, fuel provider, and any other fuel users.
    - Prepare signage and fuel distribution systems, to align with the deployment of the UL avgas to the fuel storage tank.
        - This may include posting notices and warnings in advance to make people aware of the transition.
        - If the fuel system at the training airport has self-serve pump(s), this may include updates to the credit card system, for example to include additional confirmation screens before UL avgas is dispensed.
    - This may include the presentations or sharing of informational materials for line service personnel and pilots.
    - This may also include sharing information and literature with local communities.
        - This can be especially important if the airport is making the transition to UL avgas in response to community concerns.

[40] These points only relate to switching the fuel within a fuel storage tank, in addition to considerations related to STCs, placarding, etc., described elsewhere in this document (e.g.,

Step 1: Check That Aircraft Are Authorized to Use UL Avgas; Step 2: Assess Flight School Infrastructure and Logistics).

[41] Note on comingling UL94 with 100LL in aircraft fuel tanks: Since UL94 avgas is chemically the same as 100LL (without tetraethyl lead); these fuels can be comingled in any aircraft that is approved for use of UL94. More information on interminability is available here: https://www.swiftfuelsavgas.com/faq

[42] National Air Transportation Association (NATA) White Paper: Unleaded Avgas Conversion Considerations for Aviation Fuel Providers, https://www.nata.aero/assets/Site_18/files/EAGLE/NATAUnleadedAvgasConsiderations.pdf

Eliminate Aviation Gasoline Lead Emissions (EAGLE)