Get the Lead Out!!!

2025 Update on Alternative Unleaded Aviation Gasoline

Two Paths to an Unleaded Fuel

- FAA Fleet Authorization
  - Overseen by the U.S. FAA
    - FAA does NOT certify or approve fuel, they approve the "use conditions" for an aircraft
  - Goal
    - Allow eligible aircraft and aircraft engines to operate using qualified unleaded aviation gasoline (avgas) in a manner that ensures safety via the Piston Aviation Fuels Initiative (PAFI).
    - Provide the requirements for hardware changes
- Supplemental Type Certificate (STC)
  - Owned by the applicant
  - Case by Case (*)
  - Has the requirements for hardware changes

Why One Way or the Other?

- Fleet Authorization
  - Supported by an industry consensus standard
  - Does not require case by case aircraft/engine/propeller review
  - A LOT of data required
  - As many airframe/engine/propeller combinations as possible need to be satisfied (*)
  - Time, money, resources
- Supplemental Type Certificate
  - Supported by the applicant's data
  - Each owner/operator responsible for consideration, purchase, and installation
  - Generally, the airframe/engine/propeller combination is chosen to require minimal or at least fully identifiable hardware changes

Fleet Authorization "PAFI"

- Piston Aviation Fuel Initiative (circa 2014 - 2019)
  - "Let's do the equivalent of 40 years of avgas development in 5!"
  - Learned a LOT about testing, about fuel, about hardware
  - PAFI did what it was supposed to do and evaluated potential high-octane, unleaded fuels
  - Found things that were undesirable with every offered fuel, so paused
    - *Had a plan for restarting testing after fuel offerors modified formulas*
    - *And then 2020 happened...*
    - *For a full discussion of lessons learned, check out the flyEAGLE.org website: Resources, Aug 2022 Lessons Learned*

Fleet Authorization – "EAGLE"

- "Eliminate Aviation Gasoline Lead Emissions" (current)
  - www.flyEAGLE.org
  - Four pillars
    - *Supply Chain Infrastructure and Deployment*
    - *Research, Development and Innovation*
    - *Unleaded Fuel Evaluation and Authorization*
    - *Regulation Policy and Programmatic Activities*

Fleet Authorization – "EAGLE"

- Pillar 3 Unleaded Fuel and Evaluation and Authorization (PAFI)
  - Let's take what we learned in 2019, and try again
- Why is this so slow?
  - 41 non-metallic materials
  - 32 metallic materials
  - Multiple OEM specific materials
  - 2 Aircraft hoses
  - 2 Aircraft fuel bladders and their repair components
  - 9 Polysulfide fuel tank sealants
  - 8 Paint systems
  - 2 Aircraft primer systems

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  - 3 Fuel distribution system hardware manufacturers (Coalescers, filters, sensors)
  - 2 Airport Storage Fuel Tank coatings
  - 5 Airport Distribution Hoses
  - 12 Composite (aka Plastic Airplanes) systems
  - Cold Flow Dynamic Hardware Testing

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  - Cold Storage Testing
  - Storage Stability Testing

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  - Dynamic Diaphragm Testing
  - Carburetor Ice Testing

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  - Detonation Testing
  - Durability Testing
  - Engine Testing
  - Flight testing
  - …

Supplemental Type Certificate

- A supplemental type certificate (STC) is a type certificate (TC) issued when an applicant has received FAA approval to modify an aeronautical product from its original design. The STC, which incorporates by reference the related TC, approves not only the modification but also how that modification affects the original design. (www.faa.gov/Home/Aircraft/Aircraft/Certification/Design Approvals)
- The applicant provides the data sufficient to demonstrate the modification they wish to make is safe, how to install it, what changes have to be made to the aircraft/engine/propeller, pilot operating handbook, how to maintain the A/C, instructions for continued airworthiness, etc. etc. etc.
  - Generally, it is for a single make/model/part number/application/etc., AKA the approved model list
  - The applicant makes the case for the data necessary to prove airworthiness
  - The applicant defines the test plan to develop the data to show it is sufficient

Supplemental Type Certificate

- The supplemental type certificate and its related information – all drawings, data, specifications – are the property of the supplemental type certificate holder and is confidential.
  - The STC, the authorization to install the change, and the supporting data belong to the STC owner
  - They may give you permission to use the data, up to including the authorization to make the change to your aircraft
- There are current STC's for unleaded aviation gasoline
  - Swift UL94 (ASTM D7547 Grade UL94)
  - Swift 100R (controlled availability, ASTM standard pending)
  - GAMI G100UL (G100UL-12C9 company standard)

Bringing the fuel onto the airport

- The FAA/DOT has authority over the aircraft and its operation, including the fuel
- The NFPA, OSHA, and EPA has authority over the airport and its handling equipment with possible restrictions based on agreements or grants with the FAA
  - The EPA and local governments cannot prohibit using leaded fuels on aircraft
  - They can prohibit leaded fuels on public roadways and the airfield
- The EAGLE process includes consideration of the distribution and handling of fuels
  - Swift has also included distribution component testing via ASTM D7826 guidance
  - GAMI distribution testing unknown by the author

Where are we on the Fleet Authorization?

- Money has been authorized to perform testing
- There are potential fuels being tested
- Engine and Flight-testing plans approved and underway
- In-kind and OEM testing plans approved and underway
- Update materials compatibility test plan has been developed and approved
- Continuing Pillar 3 (PAFI) testing in 2025
- Continuing to work with fuel vendors
- Continuing to support the GA industry concerns through EAGLE
  - OEM's
  - Homebuilts
  - Distributors/FBO's/Fuel Handlers