# Welcome!

# Eliminate Aviation Gasoline Lead Emissions Initiative

**Presenter** Robert Olislagers

CEO Centennial Airport, (Ret.)/NAS/ACRP

# EAGLE Goal

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

# Getting the Lead Out – Why We Have Pb and Why It Must Be Removed

## Why have it?

- Lead (Pb) is an efficient fuel additive to prevent engine knock/failure

## Why eliminate it?

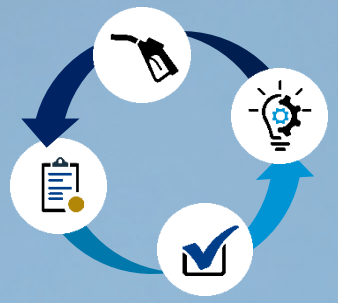
- Pb is **toxic** and we need to find an alternative

## Why now?

- The EPA is expected to issue an “endangerment finding” in the near future; however, the typical regulatory process for a final ruling will take approximately 7-8 years, hence the focus on 2030

## What’s next?

# EAGLE



**PRESIDENTIAL PRIORITIES:** Solution that meets environmental challenges; includes sustainable transportation and clean energy, protecting airport communities, and restoring our global standing

**ELIMINATE AVIATION GASOLINE LEAD EMISSIONS (EAGLE) GOAL:** 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 fleet

Government | Associations | Fuel Sector | OEMs | Airports | Operators | Airport Communities | Others

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

SAFETY | FUEL QUALITY | TRANSPARENCY | RESEARCH & DESIGN | ACCOUNTABILITY

MITIGATION | FLEET IMPACT | DIVERSITY OF THOUGHT | EDUCATION, TRAINING, AWARENESS, & OUTREACH

# Unleaded Fuel Evaluation and Authorization

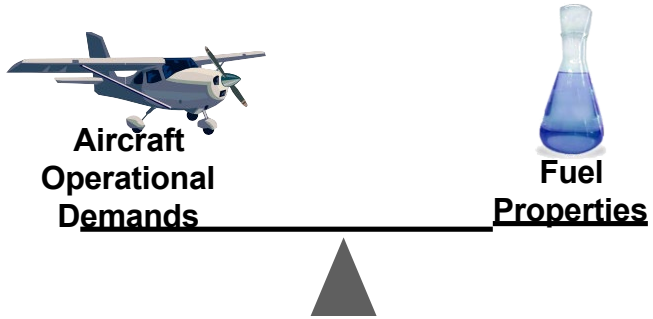
Presented by: Maria DiPasquantonio

FAA

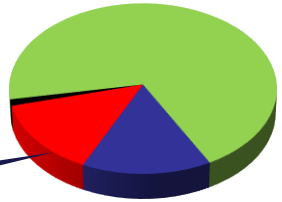
# Desired Outcomes for Unleaded Fuel Evaluation & Authorization Pillar


- **Complete** PAFI test and evaluation of candidate replacement fuels for 100 Low Lead (100LL) aviation fuel
- **Identify** at least one unleaded fuel acceptable for fleet use
- **Institutionalize** fleet authorization process for unleaded fuels
- **Include education, training, awareness, and outreach** responsibilities

# The Challenge When Removing Lead

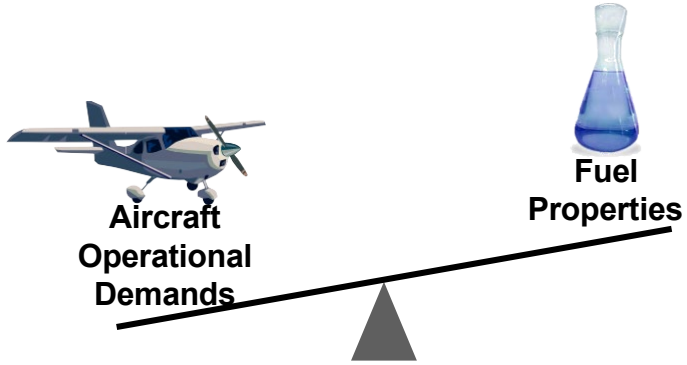


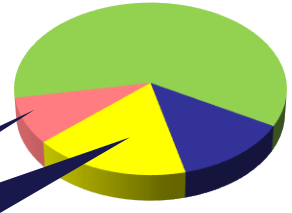




Lead (TEL) Additive

Remove Lead



New Octane-Boosting Chemicals Required to Compensate for Absence of Lead

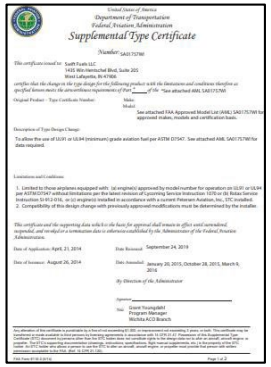
***Removing Lead Upsets the Balance Between the Fuel Properties and Aircraft Operational Demands***

# EAGLE Will Support Two Paths to Fuel Authorization

**Fleet Authorization**
Process other than traditional means of certification

| Fuel Testing | Fuel Evaluation & Approval |
|---|---|
| Fuel Authorization (other than traditional means) | |

**TC, ATC or STC**
Existing, normal certification processes


United States of America
Department of Transportation
Federal Aviation Administration
Supplemental Type Certificate
Number SA01757NE

PAFI (FAA & Industry Consensus) → **Fleet Approvals**

STC (Applicant proprietary) → **Engine/Aircraft Approvals**

## UL100 Candidates (toward replacement of 100LL)

Afton CHEMICAL

PHILLIPS 66

lyondellbasell

VP Racing FUELS

General Aviation Modifications, Inc. – GAMI
Engineering the Future of General Aviation

Swift FUELS

# Piston Aviation Fuels Initiative (PAFI): FAA/Industry Approach

**FAA-Industry Collaboration (Supported by US Govt. Funding)**

**Existing Engines/Airplanes**


**New Fuel**

Afton CHEMICAL

PHILLIPS 66

lyondellbasell

VP Racing Fuels

**PAFI**
**Piston Aviation Fuel Initiative**

**Technical Approach**

FAA Technical Center + OEM Testing + Third Party Testing

**Regulatory Approach**

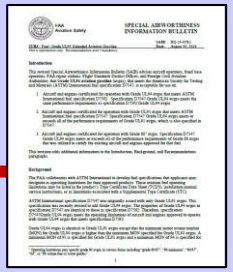
FAA Fleet Authorization

# PAFI FLEET AUTHORIZATION PROCESS (Other Than Traditional Means)

SEC. 565 (a)(3)

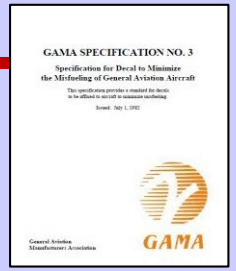
**Implementation of minor alteration for each aircraft / engine**

14 CFR Part 43

**SAIB Communication Tool** (includes information and references necessary to accomplish alteration)

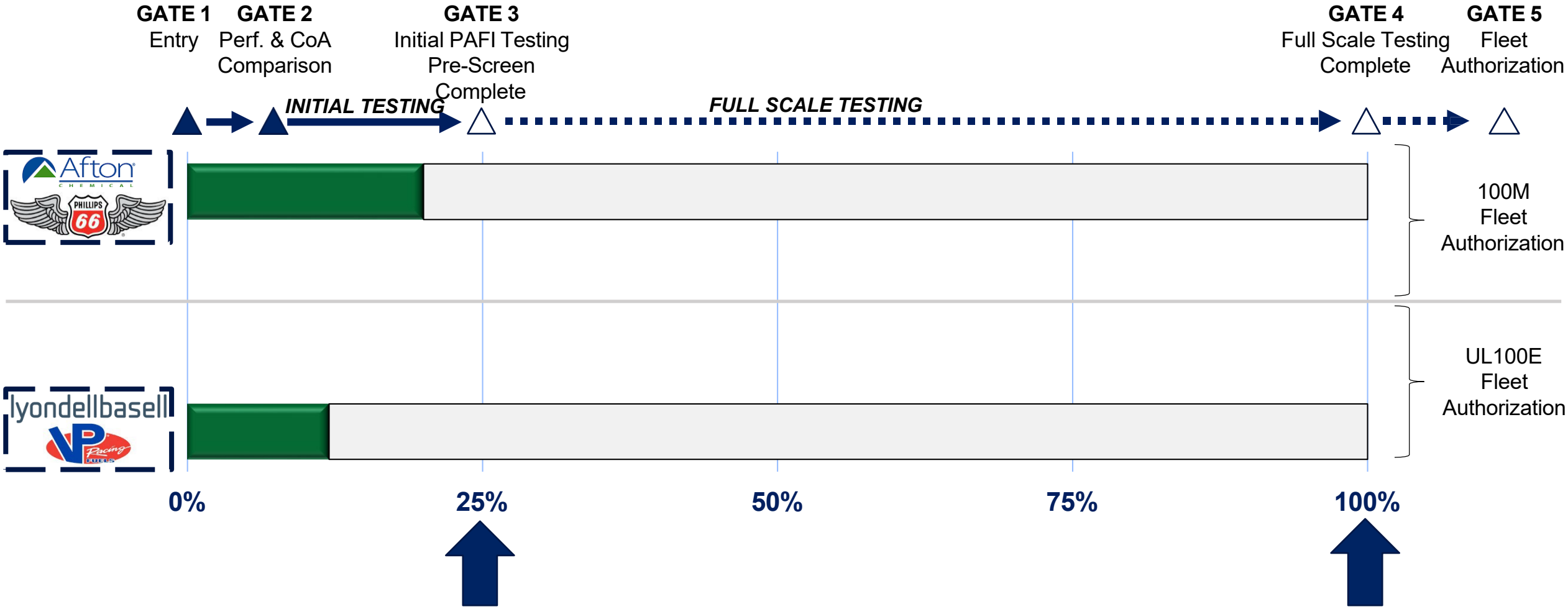
SEC. 565 (b)(1)




**GAMA** update to **Specification 3** for new fuel placards

**Each Owner/Operator of an eligible aircraft/engine configuration processes minor alteration to add fuel spec to AFM ops limitations and placard**

# PAFI Milestones Chart



# Supply Chain Infrastructure & Deployment

Presented by: Ryan Manor

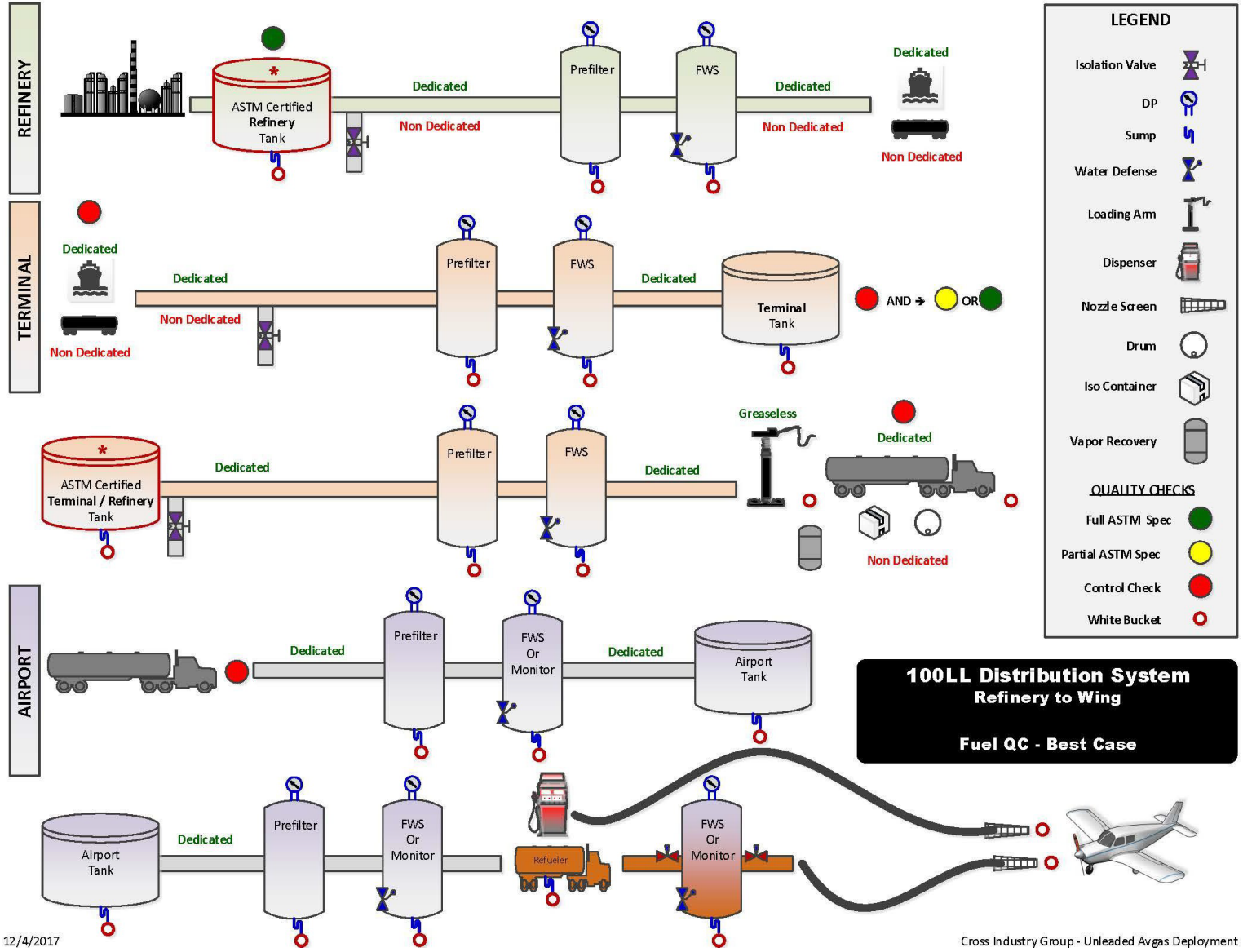
Industry

# Supply Chain Infrastructure & Deployment Pillar

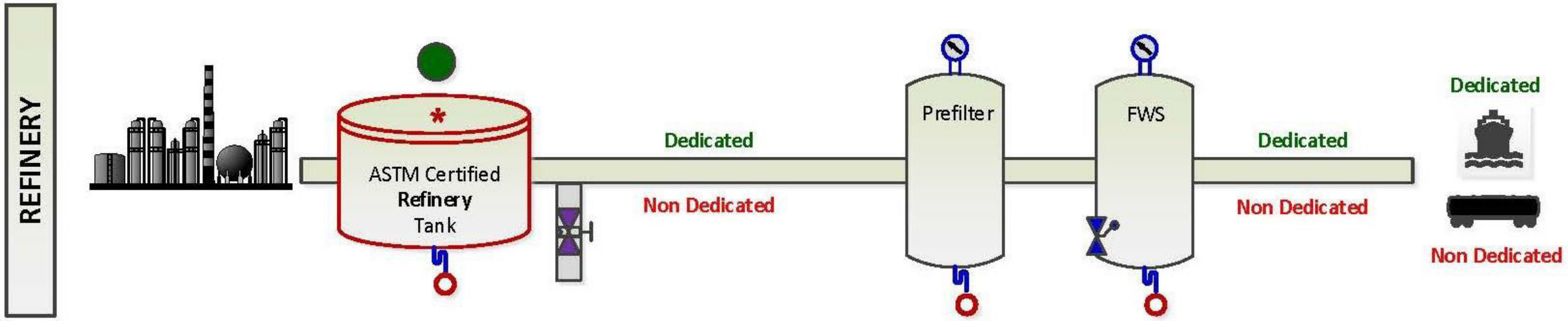
Supply Chain Infrastructure & Deployment

- **Maintain** 100LL availability during the transition
- **Support** quality-focused and commercially viable supply chain infrastructure
- **Facilitate** increased production, distribution and greater use of replacement fuels

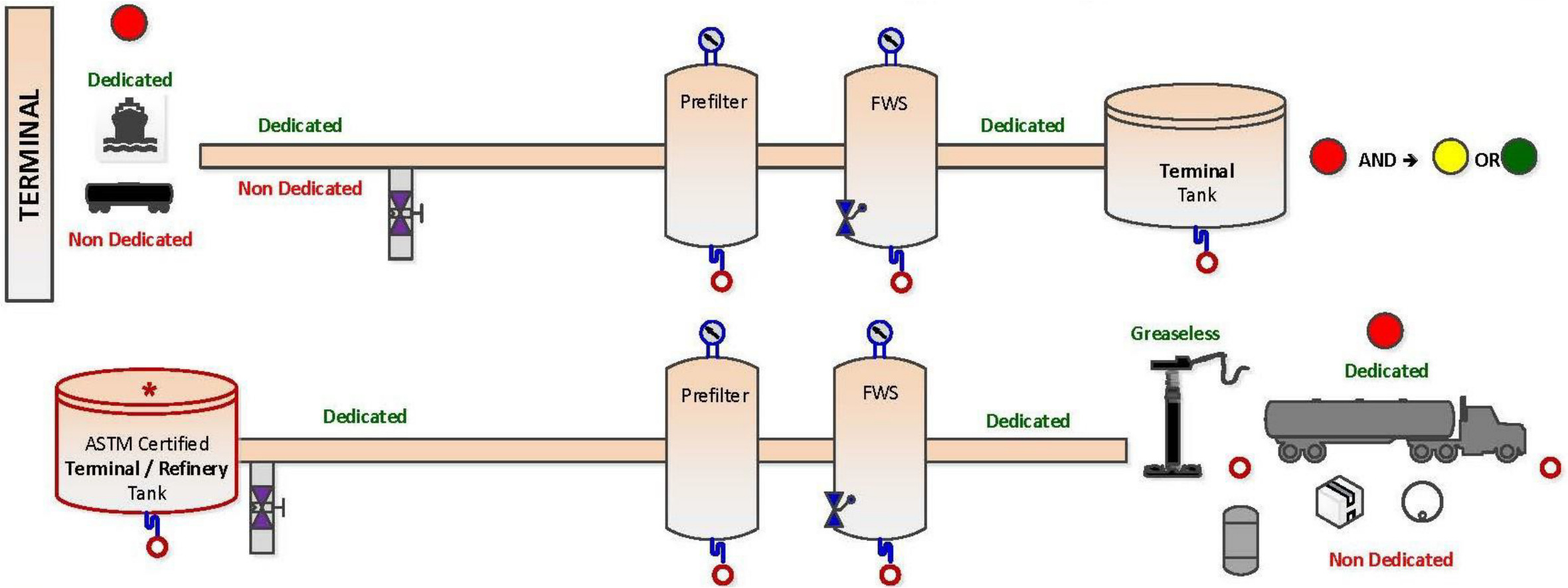
# Supply Chain Infrastructure – Aviation Gasoline



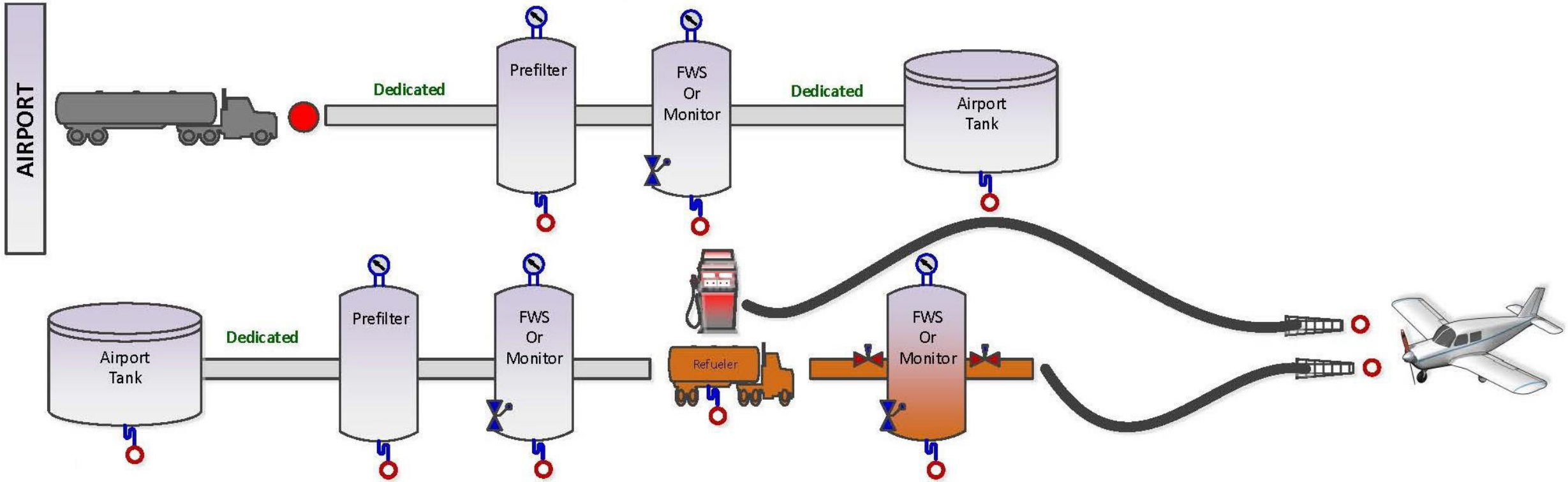
# Refinery


REFINERY
ASTM Certified
Refinery
Tank
Dedicated
Non Dedicated
Prefilter
FWS
Dedicated
Non Dedicated
Dedicated
Non Dedicated

# Terminal


TERMINAL
Dedicated
Non Dedicated
Dedicated
Non Dedicated
Prefilter
FWS
Dedicated
Terminal
Tank
AND
OR
*
ASTM Certified
Terminal / Refinery
Tank
Dedicated
Prefilter
FWS
Dedicated
Greaseless
Dedicated
Non Dedicated

# Airport


AIRPORT
Dedicated
Prefilter
FWS
Or
Monitor
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Airport
Tank
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Prefilter
FWS
Or
Monitor
Refueler
FWS
Or
Monitor

# Research, Development, and Innovation

Presented by: Walter Desrosier

Industry

# Research, Development and Innovation

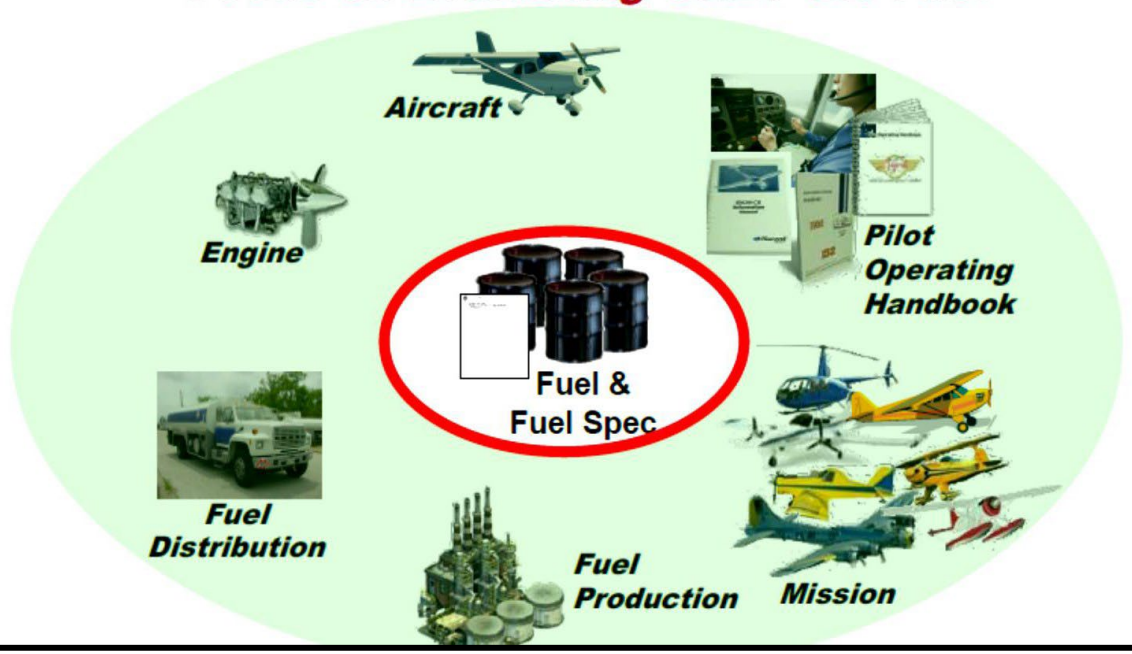

**Objective:** Facilitate Transition to Unleaded Replacement Fuel

- **Mitigate Potential Impacts** on Existing Fleet of Aircraft
- **Address Safety and Technical Challenges** Associated with High-Performance Engine Use of Unleaded Fuels
- Research and Testing of **Advanced Technology Designs**
- Focus on Effective and Timely **FAA certification**

# R&D and Innovation: Pillar Interdependencies

## Drop-In Fuel

***Plugs Into Existing Aviation Safety Infrastructure***
***Focus on Evaluating ONLY the Fuel***




## Non-Drop-In Fuel

***Must Consider Entire Aviation Safety Infrastructure***

# Mitigate Impacts on Existing Fleet


## Based on Properties and Authorization of an Unleaded Fuel

- Address safety and technical challenges associated with high-performance engine use of unleaded fuels such as:
  - Octane detonation protection
  - Materials compatibility
  - Operational procedures
  - Engine monitoring
- Where necessary, potentially enable existing engines & aircraft to safely operate using unleaded replacement fuel

# Research & Testing of Advanced Technology Designs


- **FAA and industry collaboration on R&D and testing of advanced technology & design concepts**
  - Facilitate product development, certification, and entry into service of new production and type design engine and aircraft that use unleaded fuels
- **FAA planned R&D programs**
  - Enable Greater use of lower-octane unleaded fuels
  - Alternate propulsion technologies

# Planned FAA R&D to Enable Greater Use of Lower-Octane Unleaded Fuels

Propulsion Technology

*NAS 6.3*
*UAT ARC 16*

**Aircraft / engine technologies and modifications to allow use of UL fuel with octane protection less than 100LL**

- Retarded / staggered ignition timing, reduce timing skew
- Electronic ignition / extended spark duration
- Higher pressure fuel injection systems
- Anti-detonation injection (ADI) systems (water / methanol)
- Electronic controls (EEC) AFR sensing, ignition, fuel
- Manifold air temperature reduction methods
- Cylinder head temperature reduction methods
- Turbo wastegate control improvements
- Detonation testing requirements evaluation
- Cooling climb requirements evaluation

Extensive R&D effort to determine:

1. Quantify Effective Motor Octane Number (MON) Benefits
2. Assess Fleet Impacts
3. Assess Safety Aspects

# Focus on Effective and Timely FAA Certification


- **Potential technology solutions requires FAA certification**
  - Deployment to broad range of make/model specific engine and aircraft
  - Incorporation into new production
  - Incorporation into future type design
- **Collaborative FAA-industry R&D and innovation must include consideration of effective and timely FAA certification**
  - Establishment of appropriate requirements
  - Evaluation of various acceptable means of compliance
  - Approval and authorization processes for efficient deployment

# Regulation, Policy, and Programmatic Activities

Presented by: Maria DiPasquantonio
FAA

# Desired Outcomes of the Regulation, Policy, & Programmatic Activities Pillar

- **Tracking regulatory processes** for EPA and FAA
- **Establishing policies** that affect funding for airport fueling infrastructure
- Programmatic activities that **reduce or eliminate reliance** upon leaded aviation fuels
- Includes **education, training, awareness, & outreach** responsibilities

**Cornerstones**

- Safety
- Transparency
- Stakeholder Participation
- Collaboration
- Accountability

**Key Considerations**

- Mitigation options
- Enabling other pillars

**Deliverables**

- Updates on the regulatory processes (deliberative)
- Guidance documents

# Environmental Policy Update

October 2022:

Regulation, Policy, and Programmatic Activities

- **EPA** on track to release **draft** *Endangerment Finding* for lead emissions from piston-engine aircraft
  - First step in regulatory process
  - Begins public comment period
- Final *Endangerment Finding* published in 2023

# Immediate Actions – Measures to Remove Lead Airports/Owners/Operators

- Offer additional fuel types to facilitate transition
- Increase distance between pre-flight / maintenance run-up locations and people on and off airport
- Relocate run-up location or distribute run-ups to multiple locations
- Minimize engine idle time and run-up time
- Post warning signs
- Promote airport and pilot awareness

# Safe Transition

- Our objective in EAGLE is to ensure a safe and smooth transition from 100LL to an Unleaded fuel future

- It will take all of us as a community to work together!

- Welcome to EAGLE!

# For More Information & How to Get Involved

**Please see these sites for more information:**

- FAA Avgas Website: https://www.faa.gov/about/initiatives/avgas
- FAA EAGLE Website: https://www.faa.gov/unleaded

**To contact us:**

- EAGLE Email: EagleULFuel@aopa.org

# Questions?

# Thank You!