EAGLE Stakeholder Meeting

Author FAA and Industry

Date June 23, 2022

Disclaimer

It is appropriate with competitors in the room to provide a set of antitrust guidelines. It is in everyone's interest to comply with the antitrust laws. Participants in today's meeting should observe the following guidance:

- No discussion or forecasting of prices for goods or services provided by or received by a company.
- No sharing or discussing any company's confidential or proprietary information.
- No discussion of any company's specific purchasing plans, merger/divestment plans, production information, inventories, or costs.
- No sharing or discussion of specific company compliance costs, unless publicly available.
- No agreement or discussion regarding the purchase or sale of goods or services (such decisions are independent company decisions).
- No discussion of how individual companies intend to respond to potential market/economic scenarios or government action; discussion is limited to generalities.
- No disparaging remarks regarding specific vendors' products or services.
- If a discussion presents an antitrust issue, raise your concern immediately.

This meeting is an industry-sponsored event. It is not intended to be a forum for providing consensus stakeholder advice or recommendation to the government; rather, we welcome individual perspectives on issues discussed.

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EagleULFuel@aopa.org

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Meeting Objective

EAGLE leads will provide a virtual update briefing to the broad EAGLE Stakeholder group, covering EAGLE initiatives and progress in each of the four pillars since their inception during the inaugural EAGLE meeting in March 2022

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Agenda Snapshot

10:00-10:15 Opening Session

10:15-10:45 Regulation, Policy, and Programmatic Activities Pillar Session

10:45-11:15 Unleaded Fuel Evaluation and Authorization Pillar Session

11:15-11:25 Break

11:25-11:55 Supply Chain Infrastructure and Deployment Pillar Session

11:55-12:25 Research, Development, and Innovation Pillar Session

12:25-12:30 EAGLE Next Steps

12:30 Adjourn

This meeting is an industry-sponsored event. It is not intended to be a forum for providing consensus stakeholder advice or recommendation to the government; rather, we welcome individual perspectives on issues discussed.

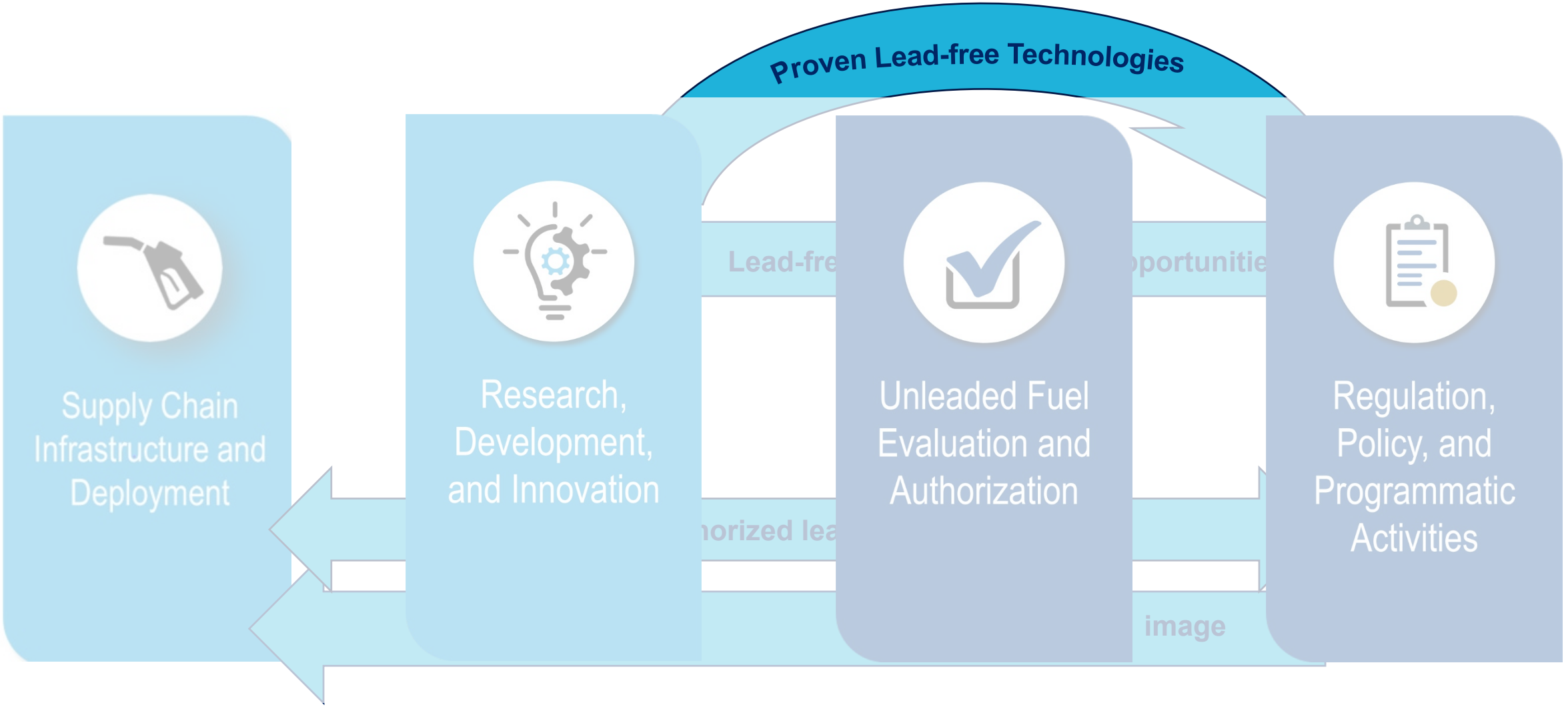
EAGLE Goal

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

Path to a Lead-Free Aviation System: 4 EAGLE Pillars

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

Pillar Interdependencies – Example



Regulation, Policy, and Programmatic Activities

EAGLE Pillars – Regulation, Policy, and Programmatic Activities

Regulation, Policy, and Programmatic Activities Outline

- Overview of Regulation, Policy, and Programmatic Activities
- EPA / FAA Regulatory Process Status Update
- Preparations to Transition Away from Leaded Avgas
- Airport Activities
- Additional Context – Demonstration Projects
- Early Adopters

Regulation, Policy, and Programmatic Activities Pillar Objectives

Work is focused on government efforts:

- **Regulatory processes** for EPA and FAA
- Policies that affect funding for airport fueling infrastructure
- Programmatic activities that **reduce or eliminate reliance** upon leaded aviation fuels
  - Lead emissions from piston-engine aircraft
  - Leaded aviation gasoline
- Includes **education, training, awareness, and outreach** responsibilities
- Key Interdependencies with other pillars (not exhaustive)
  - To Pillar A:
    - Potential to offer programs that are complementary solutions sets to unleaded fuel (e.g., engine retrofits)
    - Potential to offer programs that are additional solution sets to unleaded fuel (e.g., engine swaps)
  - From Pillar B:
    - Potential to provide proven lead-free technologies for integration into policies
  - From Pillar C:
    - Potential to provide candidate unleaded fuels for integration into policies

Cornerstones

- Safety
- Transparency
- Stakeholder Participation
- Collaboration
- Accountability

Key Considerations

- Mitigation options
- Enabling other pillars / removing obstacles

Deliverables

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

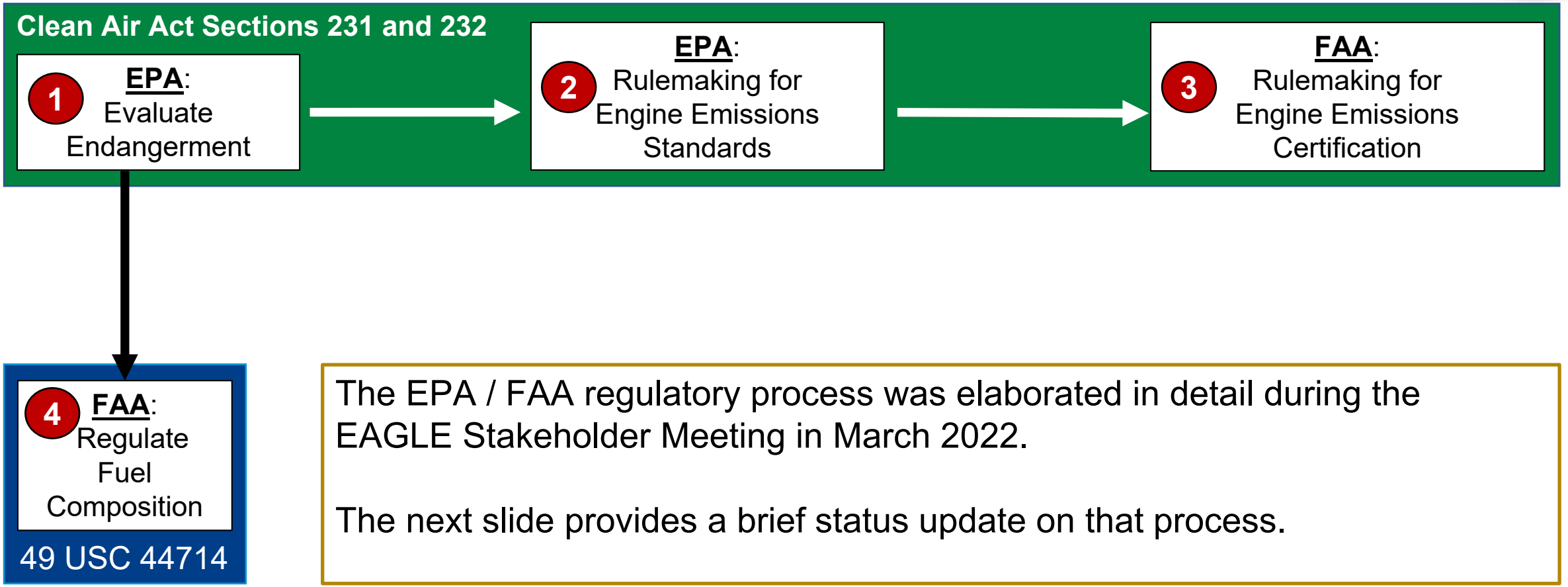
Pillar Interdependencies

- Pillar A
- Pillar B
- Pillar C

Regulation, Policy, and Programmatic Activities

EPA / FAA Regulatory Process Status Update

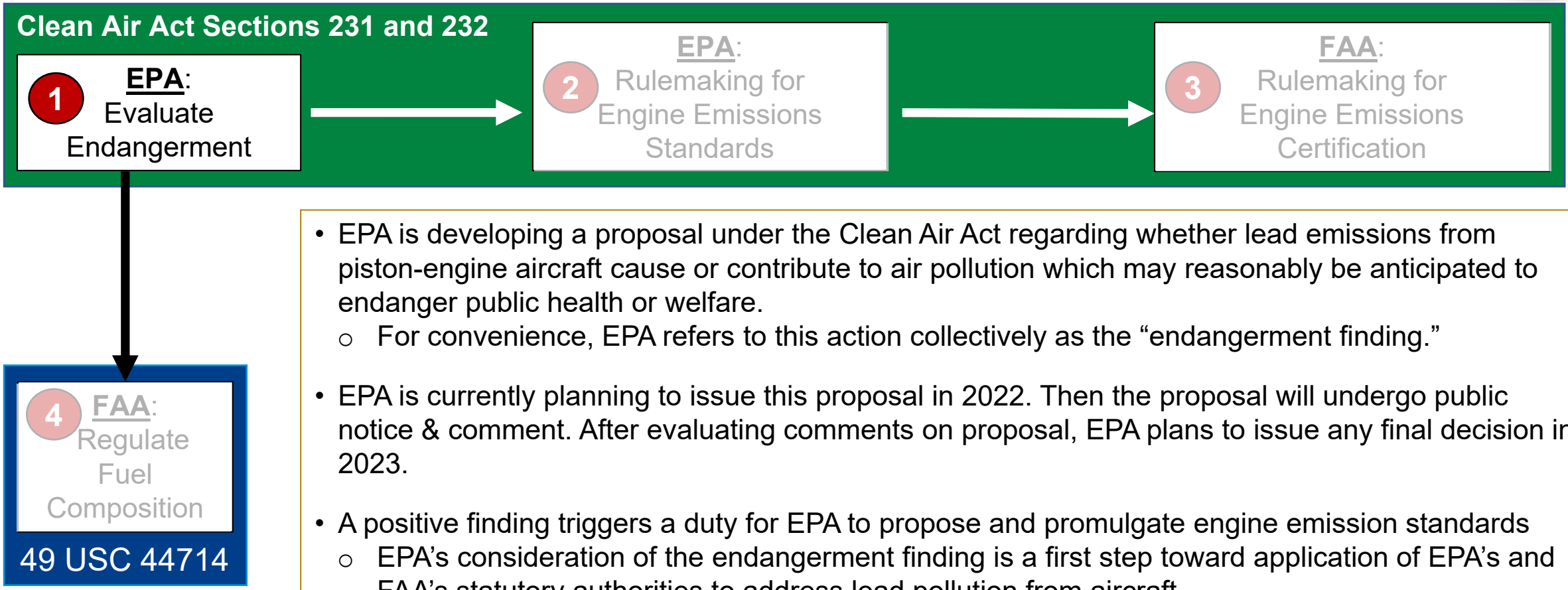
EPA & FAA Authorities Regarding Aircraft Lead (Pb) Emissions



The EPA / FAA regulatory process was elaborated in detail during the EAGLE Stakeholder Meeting in March 2022.

The next slide provides a brief status update on that process.

EPA & FAA Authorities Regarding Aircraft Lead (Pb) Emissions (cont.)



- EPA is developing a proposal under the Clean Air Act regarding whether lead emissions from piston-engine aircraft cause or contribute to air pollution which may reasonably be anticipated to endanger public health or welfare.
  - For convenience, EPA refers to this action collectively as the "endangerment finding."
- EPA is currently planning to issue this proposal in 2022. Then the proposal will undergo public notice & comment. After evaluating comments on proposal, EPA plans to issue any final decision in 2023.
- A positive finding triggers a duty for EPA to propose and promulgate engine emission standards
  - EPA's consideration of the endangerment finding is a first step toward application of EPA's and FAA's statutory authorities to address lead pollution from aircraft.

Any subsequent regulatory action would involve EPA and FAA working together and carefully considering technology, safety, noise, and economic impacts, including effects on small businesses (2 & 4).

Regulation, Policy, and Programmatic Activities

Preparations to Transition Away from Leaded Avgas

Potential FAA Programs Under EAGLE

- NASEM recommendation: “FAA initiatives, including collaborations with industry and other government agencies such as NASA should be used to promote the development, testing, and certification of safe and environmentally desirable lead-free emerging propulsion systems.”
- FAA Research & Development opportunities to create Government / Industry financial partnerships with:
  - Original Equipment Manufacturers (OEMs) to:
    - Develop no-lead technologies
    - Develop engine retrofit options
    - Develop engine swap options
    - Conduct engine emissions testing
  - Fuel manufacturers to develop sustainable fuel options
  - Flight schools transitioning to unleaded fuels

ASCENT
(Aviation Sustainability Center) Center of Excellence is an existing research partnership, ready to take on research to support the EAGLE initiative.
www.ascent.aero

Transitioning Flight Schools to UL Avgas

Ongoing efforts:

- Outreaching to flight schools and FBOs located at airports that have existing UL avgas distribution
- Developing a guidance document to support the transition of flight schools to UL avgas
- Coordination with a university-based flight school in the process of transitioning away from UL fuel
  - Experiences from their process will be incorporated into the guidance document

Transitioning Flight Schools to UL Avgas – Considerations

Aircraft
- Fleet mix
- Existing STCs / Service Bulletins or Service Instructions

Infrastructure & Logistics
- Fuel availability
- Fuel storage facilities
- Fueling procedures
- Volume of fuel used

Overarching Considerations
- Safety protocols
- Costs
- Education & training
- Stakeholder coordination

There are >640 flight schools in the U.S.
(including both universities and small flight schools)
plus additional FBOs that offer pilot training

Regulation, Policy, and Programmatic Activities

Airport Activities

Airport Context and Activities Update

Transition-Enabling Infrastructure

Guidance Updates

Immediate Actions

Airport Activities

1. **Transition-Enabling Infrastructure**
   - The FAA is authorized to provide limited grant funding for aircraft fueling systems (fuel farms)
     - Help certain Non-Primary (General Aviation) airports become self-sufficient through fuel sales
     - Increase efficiency at certain commercial service airports and reduce fuel truck emissions
   - Need to support multiple fuel types to implement EAGLE and transition to a lead free future

2. **Guidance Updates**
   - The FAA has already made updates to draft guidance in response to NAS recommendations
     - Updated AC was published, March 31, 2022
     - Documented that engine run-ups can contribute to lead concentrations near run-up areas and provides recommendations (AC 5300-13B, *Airport Design*)

3. **Immediate Actions (in alignment with NAS recommendations)**
   - Airport owners / operators and pilots can implement simple mitigation measures
     - Work to offer additional fuel types to facilitate transition
     - Increase distance between pre-flight / maintenance run-up locations and people on and off airport
     - Consider wind direction in run-up area choice
     - Minimize engine idle time and run-up time
     - Post “exhaust fume” warning signs
     - Promote airport and pilot awareness

Regulation, Policy, and Programmatic Activities

Additional Context – Demonstration Projects

Demonstration Projects

Helping to transition away from leaded avgas

Timeline TBD

Select a regionally diverse small set of airports with different operational characteristics	Establish appropriate demonstration activities that support the EAGLE initiative	Carry out demonstration project activities
Discussions ongoing	Potential examples: • Relocating run-up locations • Pilot recycling of avgas samples • Training programs (pilots; STEM) • Fuel transitioning	Produce national guidance that can be offered to the EAGLE initiative

Regulation, Policy, and Programmatic Activities

Early Adopters

Early Adopters

Leveraging Existing Infrastructure

- 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
  - The Port of Portland is 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
  - Consulting other airports that offer UL94 regarding lessons learned

Pursuing Transition-Enabling Infrastructure

- City of San Diego, Montgomery Gibbs-Executive Airport (MYF)
  - Pursuing new fuel infrastructure to adopt UL94
  - 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

Regulation, Policy, and Programmatic Activities Stakeholder Discussion

Unleaded Fuel Evaluation and Authorization

EAGLE Pillars – Unleaded Fuel Evaluation and Authorization

Supply Chain Infrastructure and Deployment

Research, Development, and Innovation

Unleaded Fuel Evaluation and Authorization

Regulation, Policy, and Programmatic Activities

Unleaded Fuel Evaluation and Authorization Pillar Objectives

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

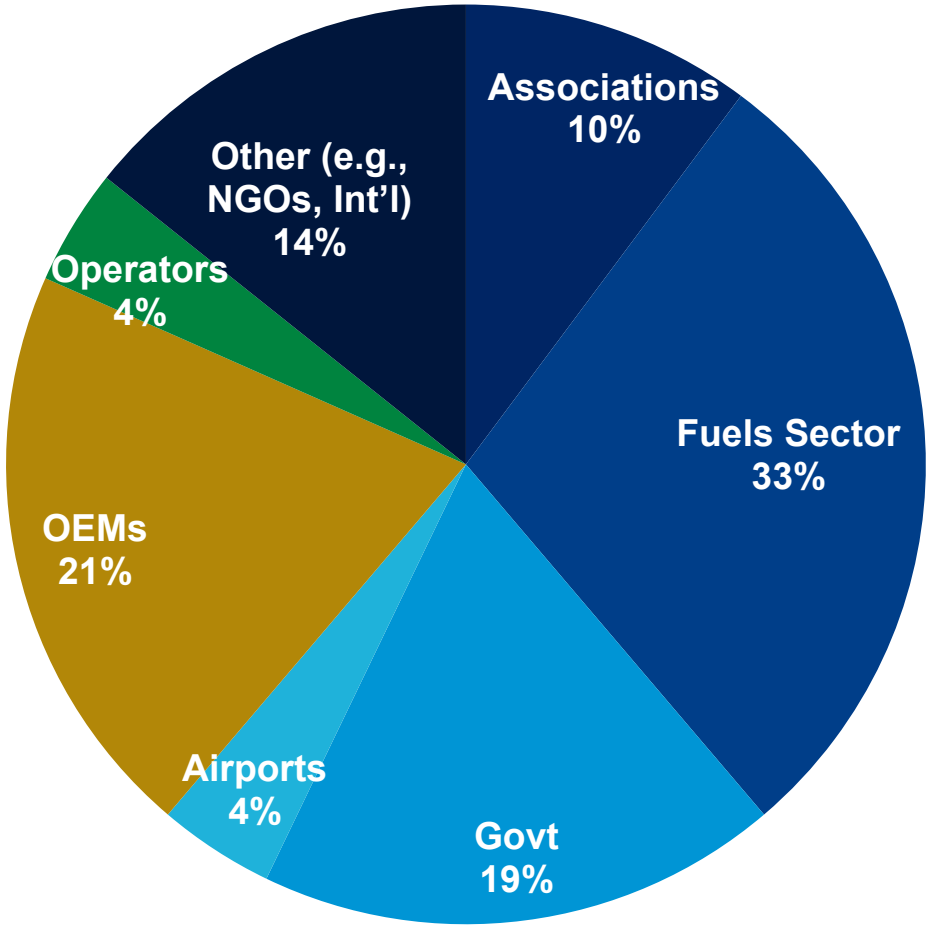
Cornerstones
- Transparency / Accountability
- Stakeholder Participation / Collaboration
- Technical Excellence / Objectivity

Key Considerations
- Fuel Quality
- Safety
- Fleet Impact
- Mitigations
- Research and Development

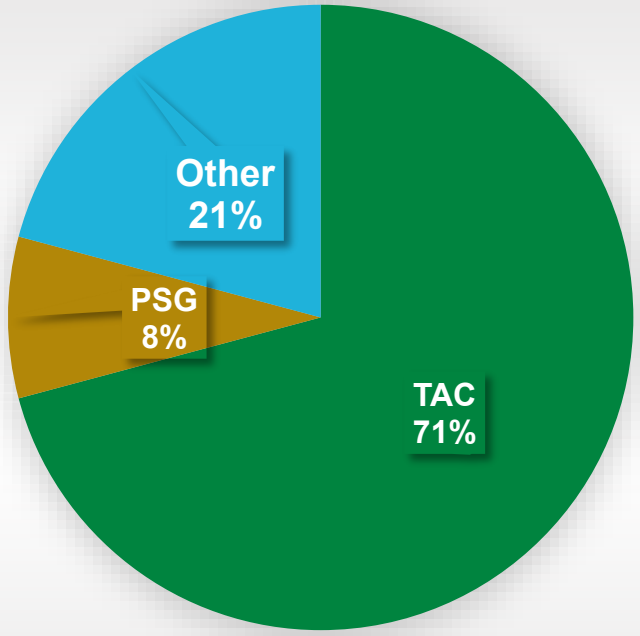
Deliverables
- Fleet Authorization Process
- Authorizations for Fuels / Eligible Models
- Test & Evaluation Process / Test Plans
- Lessons Learned / FAQs
- Data and Reports → R&D Efforts (Pillar B)

Pillar Interdependencies
- Supply Chain Infrastructure and Deployment (Pillar A)
- Research, Development, and Innovation (Pillar B)
- Regulation, Policy, and Programmatic Activities (Pillar D)

Unleaded Fuel Evaluation & Authorization Pillar Stakeholder Composition (49)



Pillar C Workgroups



8% PAFI Steering Group (PSG) Members
71% PAFI Technical Advisory Committee (TAC) Members
21% Other

EAGLE Unleaded Aviation Gasoline Roadmap Framework

Current State

Future State

Unleaded Fuel Evaluation and Authorization

No currently qualified unleaded drop in replacement for 100LL avgas

Piston Aviation Fuels Initiative (PAFI) ***UAT ARC***

Qualified drop in unleaded fuels available

Fleet Authorization process in coordination

Streamlined approval process ***Section 565(a)***

Fleet Authorization process institutionalized (UL91/94...UL100)

Existing ATC and STC fuel projects for specific engines and aircraft

Traditional approval process ***Section 565(c)***

Enhanced guidance for ATC and STC fuel projects for specific engines and aircraft

Supply Chain Infrastructure and Deployment

Regulation, Policy, and Programmatic Activities

Unleaded fuels not widely available at airports

Improve fuel infrastructure ***NASEM***

Multiple unleaded fuels available

Research, Development, and Innovation

All engines and aircraft cannot satisfactorily operate with fuels less than 100 octane

Engine/aircraft modifications ***NASEM***

Engine replacement – technology ***NASEM***

All aircraft and engines operating with unleaded fuel

Unleaded Fuel Evaluation and Authorization Pillar Accomplishments

Recently completed EAGLE Pillar Deliverables

- Frequently Asked Questions (FAQs)
- Lessons Learned document
- PAFI Test Plan Index
- To be posted to: Aviation Gasoline | Federal Aviation Administration (faa.gov)

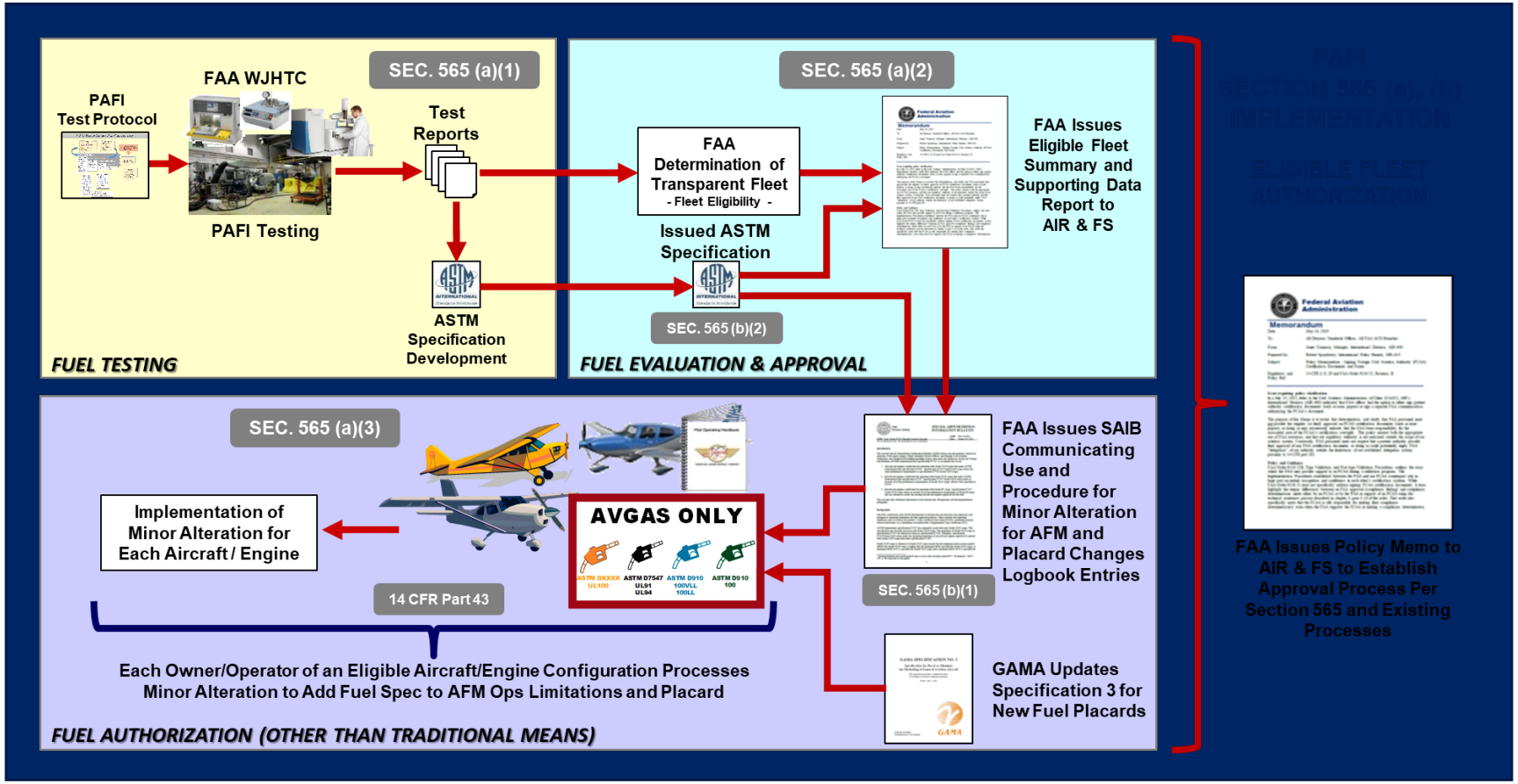
Pillar C Outreach and Collaboration – Ongoing

- EAGLE Steering Group (ESG) Meetings – Weekly
- Quarterly PAFI Steering Group (PSG) Meeting – Latest: May 24, 2022
- Pillar C – Stakeholder Kick-Off Meeting – June 15, 2022
- Ongoing cross-pillar collaboration:
  - Supply Chain Infrastructure and Deployment – Technical issues / data sharing
  - Research, Development, and Innovation Pillar – Planned and funded R&D efforts – Engine mods
  - Regulation, Policy, and Programmatic Activities Pillar – Planning efforts

Unleaded Fuel Evaluation & Authorization Pillar Accomplishments (Cont.)

Fleet Authorization Process

- Undergoing final FAA formal review
- NOTICE to be published in Federal Register for public comment (July / August 2022)
- 30-day public comment period
- Upon comment disposition, Final Notice to be published in Federal Register
- UL91 Fleet Authorization to follow

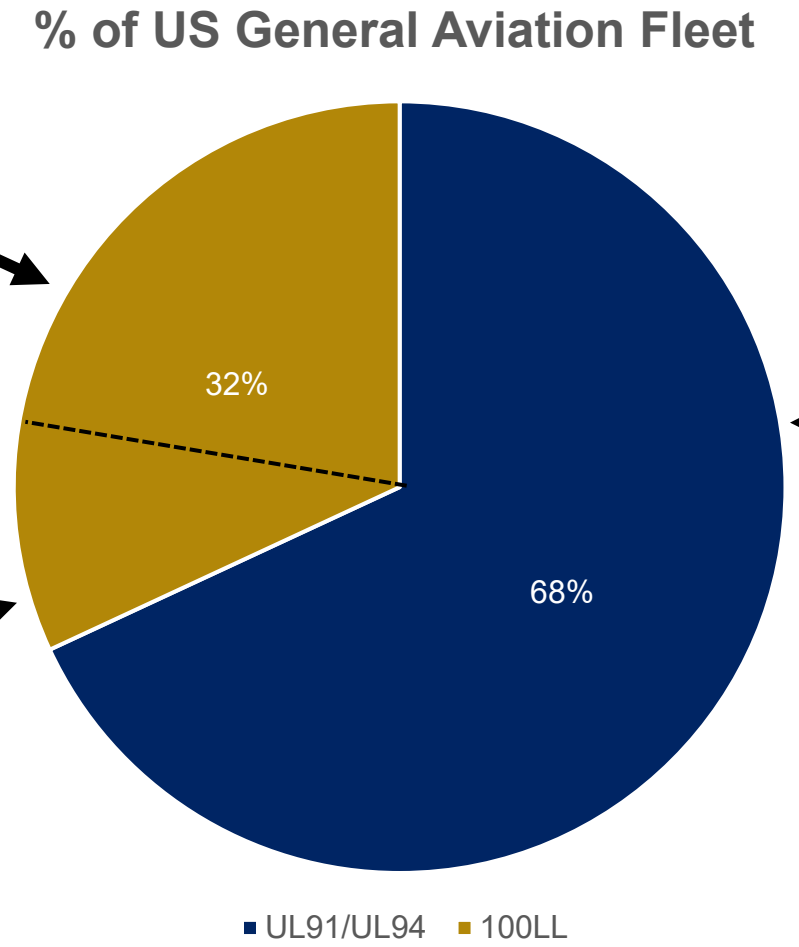


Initial Fleet Authorization of UL91 Will Enable Unleaded Operation by 68% of Fleet

PAFI Target → 100LL Fleet
High Octane Unleaded
32% of Fleet
2022 thru 2025

Note: Additional aircraft may be authorized for **UL94** pending planned testing.

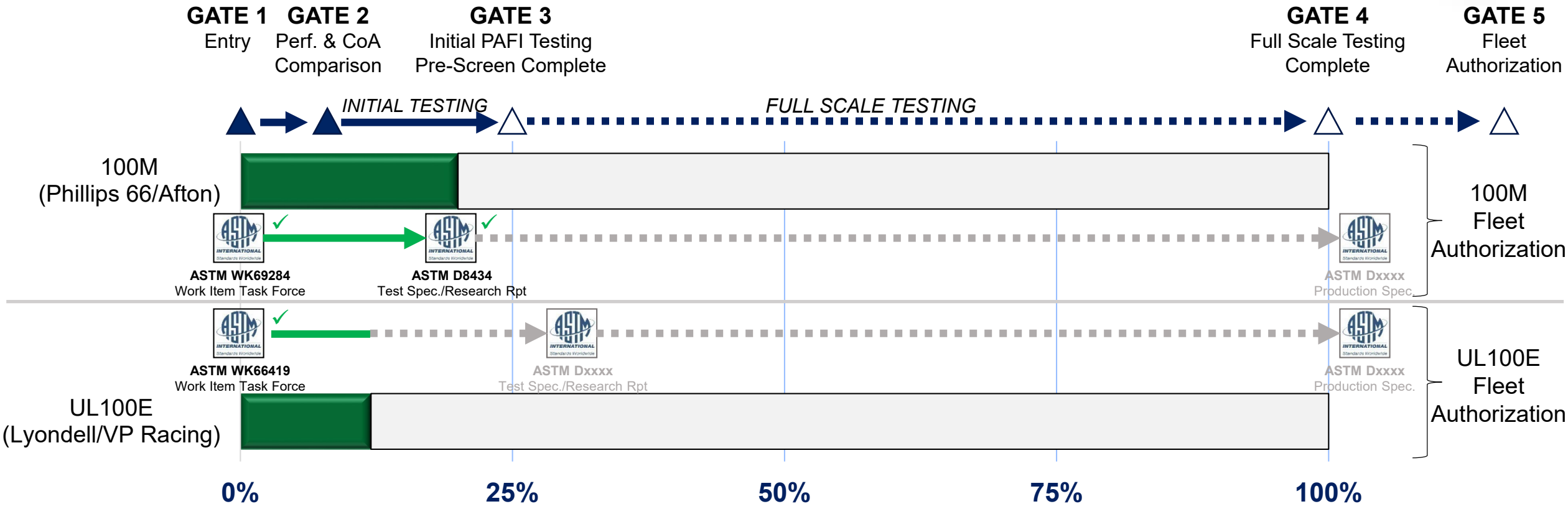
The remaining 100LL fleet would reduce to about 21% of the fleet (by end of 2023)



Fleet Authorization 1
ASTM D7547 (UL91, UL94)
68% of Fleet
By end of 2022

ASTM D7547 **is** 100LL without the lead

PAFI Milestones Chart



If fuel received by ~July 31, 2022, initial PAFI testing for both fuels expected by December 2022

***Gate 4 Schedule Contingent Upon:**

- Fuel availability in timely manner
- Fuel successful testing
- Test cell availability
- In kind test resources
- Funding

Estimate Oct 2024*

Education, Training, Awareness, and Outreach

Upcoming outreach and engagement opportunities:

- Stakeholder Pillar C meetings
- PAFI Technical Advisory Committee (TAC) meeting – July 2022
- Lessons Learned webinar – August / September 2022
- Fleet Authorization Policy Memo webinar – Fall 2022 (TBD)

Unleaded Fuel Evaluation and Authorization Stakeholder Discussion

EAGLE Email: EagleULFuel@aopa.org

Supply Chain Infrastructure and Deployment

EAGLE Pillars – Supply Chain Infrastructure and Deployment

Supply Chain Infrastructure and Deployment

Research, Development, and Innovation

Unleaded Fuel Evaluation and Authorization

Regulation, Policy, and Programmatic Activities

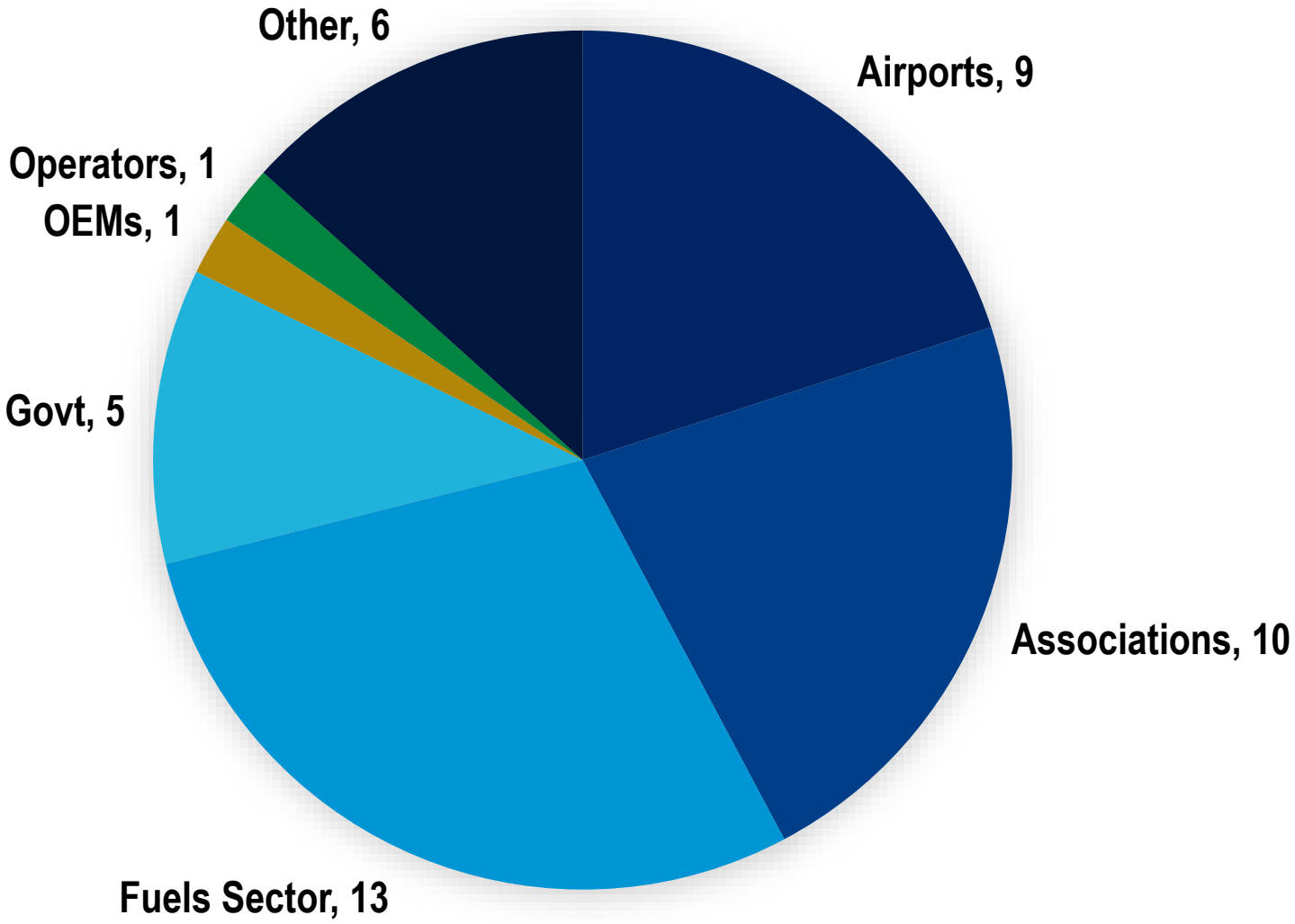
Topics

- Progress
- Membership
- Goals & Objectives
- Approach
- Deployment Summary
- Work in Progress / Next Steps

Progress On Next Steps From March Meeting

- Develop framework to achieve EAGLE objectives and engage stakeholders
  - Foundation document
  - Project tools
  - Objective breakout to workstreams
  - Team member outreach
  - Pillar A kickoff meeting
- Utilize Deployment Guide and Action Plan as a starting point while keeping in mind the EAGLE initiative is much more comprehensive
  - Transition PAFI Deployment Team work to EAGLE
- Develop infrastructure database (terminals, refiners, FBOs, aircraft, equipment, etc.)
  - In progress
- Develop communication channels beyond association members
  - SharePoint site for collaboration
  - Contact list
  - Broader communication channels will be developed as part of overall EAGLE initiative

Membership – 45



Membership Entities

Fuels Sector

Avfuel Corporation

Chevron

Flint Hills Resources

GAMI

Phillips 66

Racing Fuels, Inc.

Shell

Swift Fuels, LLC

World Fuel Services

Airports

Avint, LLC

Bemidji Aviation Services, Inc.

City of San Diego

County of Santa Clara

Moore Co Airport (SOP)

Naples Airport Authority

Port of Portland

Associations

API

COPA

EAA

GAMA

NATA

NBAA

Other

Aeroplex Group Partners

Aviation Management Consulting Group

EASA

Environment and Climate Change Canada

South Carolina Aeronautics Company

Operators

Events Air

OEMs

Robinson Helicopter Company

Government

FAA

EAGLE's 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

Supply Chain Infrastructure and Deployment Pillar Objectives

- **Evaluate** and support program(s) that **incentivize** fuel producers and distributors, aircraft and engine manufacturers, and GA operators **to accelerate development, qualification, deployment, and use of unleaded fuels**
- **Facilitate** policy proposals at the Federal and State level **to increase production and distribution** – as well as enable and encourage greater use – of commercially viable replacement unleaded fuel
- **Facilitate** government policy, regulatory proposals and voluntary consensus standards that will support a **commercially viable supply chain** and **quality-focused infrastructure** for the deployment of unleaded fuel, including the promotion of free-market competition
- Evaluate **Environmental, Social, and Governance** (ESG) commitments to help engage additional organizations and investors in this effort
- Support policy and regulatory proposals for **maintaining 100LL availability** and airport access to **ensure safety** during the transition across the country for use by general aviation aircraft

Approach
- Systematic | Data Driven | Coordinated

Cornerstones
- Safety
- Fuel Quality: Clean, Dry & On Spec
- Transparency
- Stakeholder Participation
- Diversity of Thought
- Collaboration
- Accountability
- Outreach, Education & Training

Key Considerations
- Mitigations
- Cost/Benefit
  - Public Health Risks
  - Environmental Impact
  - Business Impact
- 2nd and 3rd Order Impacts

Pillar Interdependencies
- Research, Development, and Innovation (Pillar B)
- Unleaded Fuel Evaluation and Authorization (Pillar C)
- Regulation, Policy, and Programmatic Activities (Pillar D)

Aim


collaborative
mitigate
effective
assist
engage
consensus
incentivize
accelerate
increase
evaluate
enable
help
support
facilitate
safety
encourage
timely
coordinate
voluntary
quality

Objective 1: Evaluate and Support

Evaluate and support program(s) that incentivize fuel producers and distributors, aircraft and engine manufacturers, and GA operators to accelerate development, qualification, deployment, and use of unleaded fuels

Incentivize

Accelerate

	Development	Qualification	Deployment	Use
Producers	X	X	X	
Distributors			X	X
FBOs/Airports			X	X
Aircraft/Engine Mfg.		X	X	
GA Operators				X

Evaluate & Support

Outreach **Education** **Training**

Pillar Interdependencies

Incentives: Policies, removing barriers, etc.

Objective 2: Facilitate Policy Proposals

Facilitate policy proposals at the Federal and State level to increase production and distribution – as well as enable and encourage greater use – of commercially viable replacement unleaded fuel

		Enable & Encourage		
		Increased Production	Increased Distribution	Greater Use
Facilitate	Federal Policy Proposals	✓	✓	✓
	State Policy Proposals	✓	✓	✓

Commercially Viable

Outreach **Education** **Training**

Pillar Interdependencies

Objective 3: Facilitate Government Policy

Facilitate government policy, regulatory proposals and voluntary consensus standards that will support a commercially viable supply chain and quality-focused infrastructure for the deployment of unleaded fuel, including the promotion of free-market competition

		Support Deployment of UL Fuels	
		Commercially Viable Supply Chain	Quality Focused Infrastructure
Facilitate	Federal Policy Proposals	✓	✓
	State Policy Proposals	✓	✓
	Consensus Standards	✓	✓

Free Market Competition

Outreach **Education** **Training**

Pillar Interdependencies

Objective 4: Evaluate Environmental, Social, and Governance

Evaluate Environmental, Social, and Governance (ESG) commitments to help engage additional organizations and investors in this effort

		Engage	
		Organizations	Investors
Facilitate	Commitments	✓	✓

Outreach Education Training

Objective 5: Support Policy and Regulatory Proposals

Support policy and regulatory proposals for maintaining 100LL availability and airport access to ensure safety during the transition across the country for use by general aviation aircraft

		Transition		
		Maintain 100LL Availability	Maintain Airport Access	Ensure Safety
Support	Policy	✓	✓	✓
	Regulatory Proposals	✓	✓	✓

General Aviation Aircraft

Outreach **Education** **Training**

Pillar Interdependencies

Project Elements

Communication
- Awareness
- Education
- Training
- Project updates
- SharePoint site
- Website

Project Tools
- Tasks
- Timelines

Database
- Contracts
- Aircraft
- Supplemental TCs
- Refineries
- Terminals
- Airports
- Airport tanks
- EPA lead study
- Fuel usage

Analysis
- Cost/benefit
- Risk matrix
- Bow tie
- Decision tree

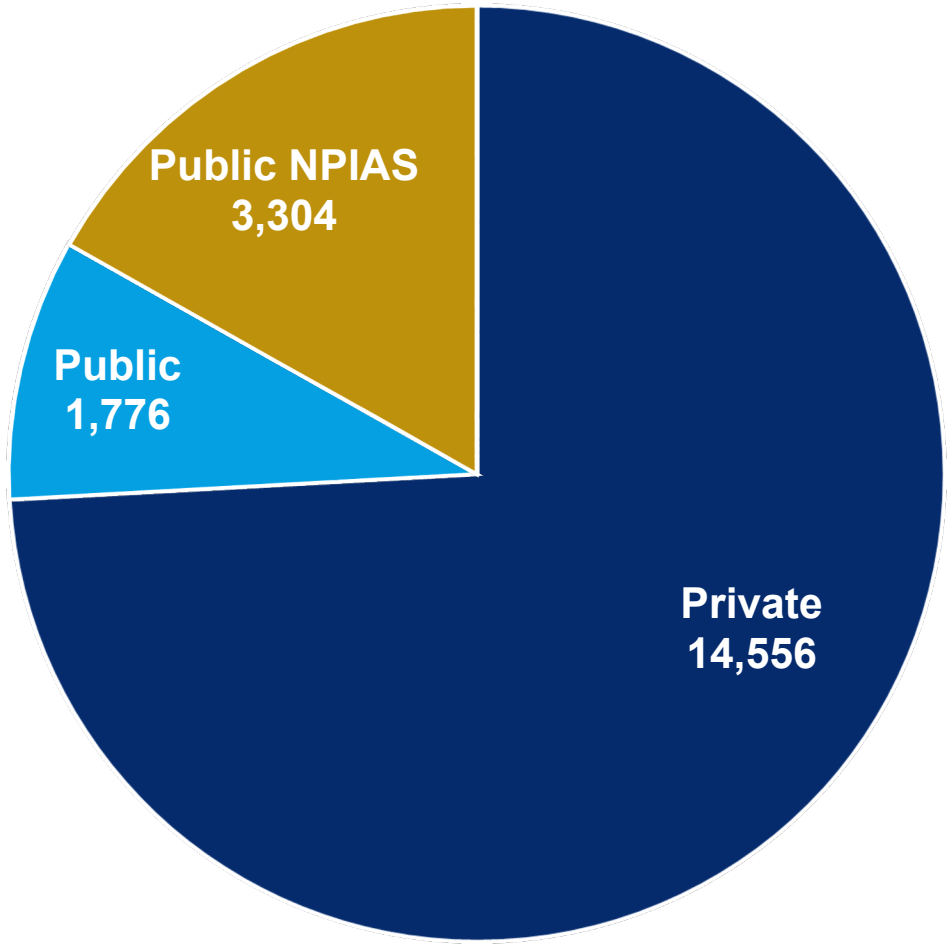
Workstreams
- Refining
- Logistics
- Airports
- ES&G

Level Setting Doc.
- Pillar A foundation
- Avgas 101
- Airport categories
- Current / new UL fuels

Metrics
- Airports w/ 100LL
- Airports w/ UL fuels
- UL fuel sold
- Refineries producing UL fuels

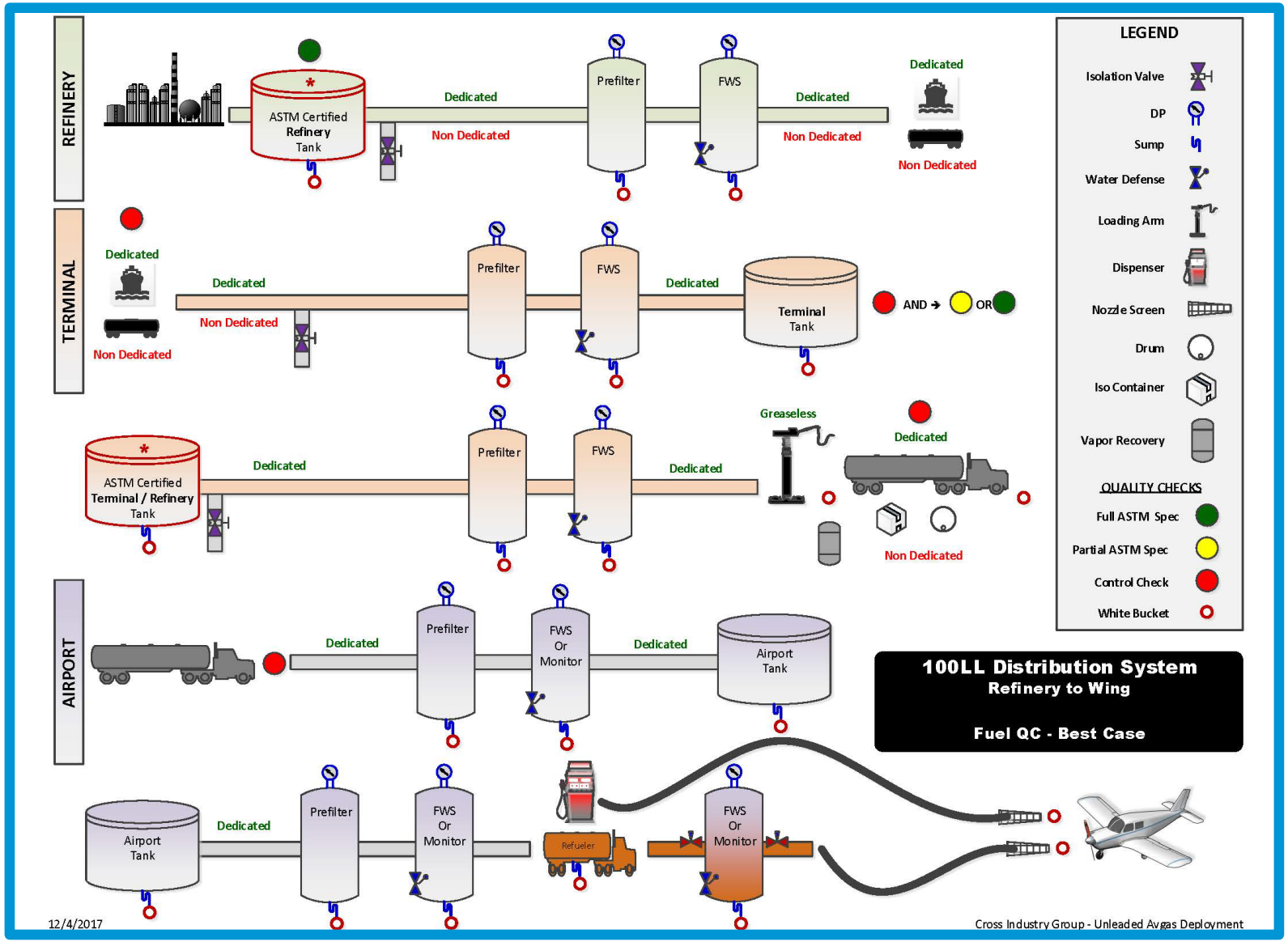
Airports

NPIAS: National Plan of Integrated Airport Systems



Source: National Plan of Integrated Airport Systems (NPIAS) 2021–2025 (page 5)

Aviation Gasoline Distribution System – "Refinery to Wing"



Deployment

Deployment Tasks

COLLAPSE

Task #	Responsibility	Topic: F.04	Impact	Status	Due	Complete
F.04.01	Distribution System	Matrix	Hi			

Task - Question

See "Distribution System" tab for matrix of potential impacts related to system components, fuels, training, HSE, handling and industry guidance documents.

Resolution - Answer

Systematically work through the list of potential impacts to determine need for modifications. This is fuel specific.

IMPACTS

HS&E
- [x] Health
- [x] Safety
- [x] Environmental

Fuel Quality
- [ ] Fuel Specification
- [ ] Cross Loading
- [ ] Cleanliness
- [ ] Misfueling

Materials Compatibility
- [ ] Fueling Hoses
- [ ] Filtration Material
- [ ] Tank Coatings
- [ ] Metals

AREA OF EXPOSURE / RISK

Area of Exposure
- [ ] Manufacturing Facility
- [ ] Terminal
- [ ] Pipeline
- [ ] Marine Vessel
- [ ] Rail Car
- [ ] Road
- [ ] FBO
- [ ] Aiframe
- [ ] Engine

Risks
- [ ] Misfueling
- [ ] Cross Contamination
- [ ] Dirt & Water

CONTROLS / MITIGATIONS

- [ ] Awareness Campaigns
- [ ] Warnings/Disclaimers
- [ ] Sampling & Testing Protocol
- [ ] Aircraft Fuel Tank Restrictor Plates
- [ ] Training (Terminals)
- [ ] Training (Carriers)
- [ ] Training (FBOs)
- [ ] Training (Pilots)
- [ ] Manufacturer's Guidance
- [ ] Cross Loading Chart
- [ ] Placards
- [ ] Segregation
- [ ] Dedicated Equipment
- [ ] Fuel Color
- [ ] Effectiveness of Controls

RESPONSIBILITY

- [ ] Manufacturer
- [ ] Carrier (Pipeline)
- [ ] Carrier (Water)
- [ ] Carrier (Rail)
- [ ] Carrier (Road)
- [ ] Contractor (maint., inspect., lab)
- [ ] Fuel Supplier
- [ ] FBO
- [ ] Airport
- [ ] Pilot

EAGLE Pillars

- [x] A - Business (Fuel) Infrastructure & Implementation
- [ ] B - Research, Development & Innovation
- [ ] C - Unleaded Fuel Evaluation & Authorization
- [ ] D - Regulation, Policy & Programmatic Activities

PAFI Teams

- [ ] State & Federal Legislative
- [ ] Aircraft Fuels Regs. & Stds.
- [x] Fuel Manufacturing Capability
- [x] Distribution System
- [x] Airport
- [ ] Aircraft Modifications
- [ ] Communication & Training
- [ ] International Communications

Bowtie Analysis	Goal	Mitigation
· Risks	· Clean	· Equipment
· Events	· Dry	· Procedures
· Causes	· On Spec	· Training
· Consequences	· Correct Grade	
· Barriers		

Work in Progress / Next Steps

- Pillar A Team Member Outreach
- Build Out Work Streams
- Level Setting Documents
- Metrics

Supply Chain Infrastructure and Deployment

Additional Information

Metrics

- Number of airports with unleaded fuels
- Estimated gallons
- Reduced lead emissions
- Reduced exposure to children
- Show progress over time and relative to end goal

Supply Chain Infrastructure and Deployment Stakeholder Discussion

EAGLE Stakeholder Meeting – June 23, 2022

Research, Development, and Innovation

Presented by: Walter Desrosier, GAMA

EAGLE Pillars – Research, Development, and Innovation

Supply Chain Infrastructure and Deployment

Research, Development, and Innovation

Unleaded Fuel Evaluation and Authorization

Regulation, Policy, and Programmatic Activities

Research, Development, and Innovation Pillar Objective

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**

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

Mitigate Impacts on Existing Fleet (Cont.)

Based on Properties and Authorization of an Unleaded Fuel

Notional Examples

UL100 Candidate Developers

Afton Chemical, Phillips 66, lyondellbasell, VP Racing Fuels, Shell Aviation, Swift Fuels

Potential UL96/97/98
(TBD: Consideration by current producers of potential avgas without TEL)

ExxonMobil, Phillips 66, Shell Aviation, air bp, Total, Chevron

Current UL91/94 (Current producers in US & Europe)

Total, Swift Fuels, Hjelmco Oil

Research & Testing of Advanced Technology Designs

FAA and industry collaboration on R&D and testing of advanced technology and 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

Aircraft / engine modifications to allow use of UL fuel with octane less than 100 for large part of the fleet

- 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 waste-gate control improvements
- Detonation testing requirements evaluation
- Cooling climb requirements evaluation

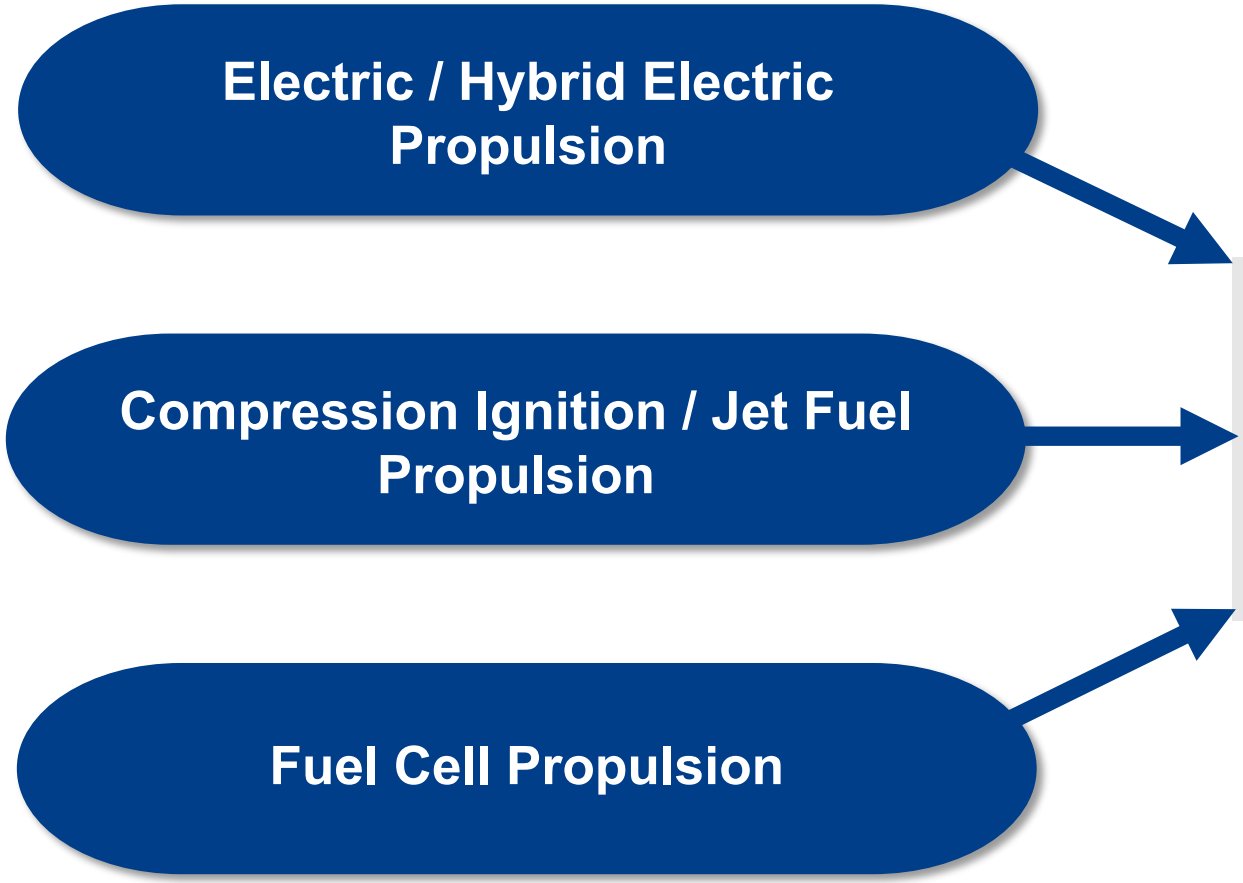
Extensive R&D effort to determine:

1. Quantify effective Motor Octane Number (MON) benefits
2. Assess fleet impacts
3. Assess safety aspects

NAS 6.3
UAT ARC 16

Planned FAA R&D of Alternate Propulsion Technologies

Other Propulsion Technologies



Perform extensive R&D to determine:

- Effectiveness
- Fleet impact
- Safety

NAS 6.3

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

Next Steps

- Identify interested stakeholders to participate
- Establish pillar working group & meeting schedule
- Identify R&D technology and process areas and existing activities
- Develop proposed work-plan activities

Research, Development, and Innovation Stakeholder Discussion

Summary and Next Steps

- Meeting information and slides to be sent next week
- Next stakeholder meeting – sharing of progress, plans, cross-pillar collaboration and next steps
  - November 2022
  - Location: TBD, DC Metro Area; Virtual
- We need your input: EagleULFuel@aopa.org

Thank You for Attending!

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