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PAFI

Piston Aviation Fuels Initiative Future Unleaded Aviation Gasoline

EAA AirVenture 2014

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Presenters

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Briefing Outline

- Key Takeaways
- Background
- Current and Future -
 - Piston Aviation Fuels Initiative (PAFI)
- PAFI Test Program
- Fleet Wide Approval
- FAA Funding

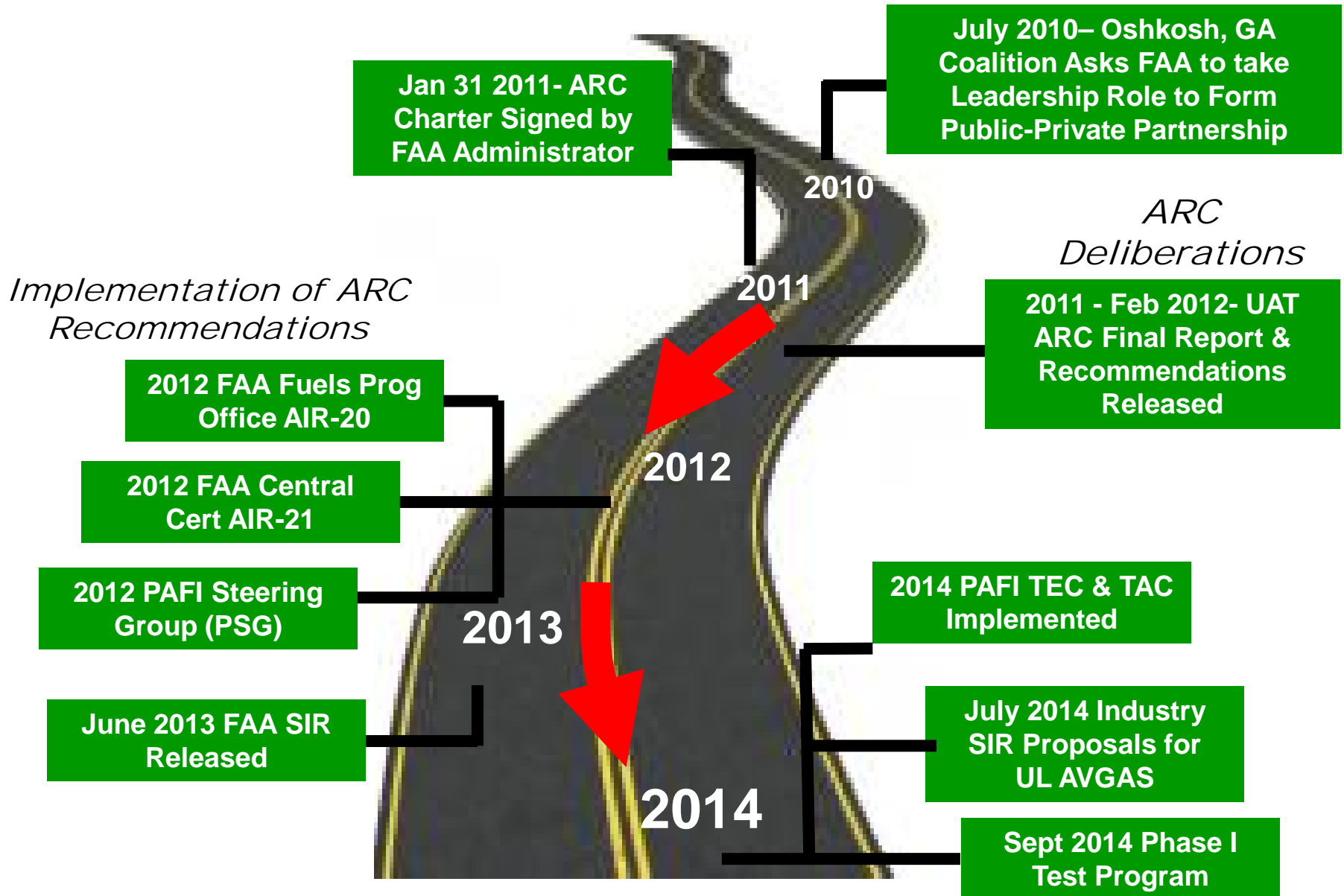
Key Takeaways

- FAA/Industry Piston Aviation Fuels Initiative (PAFI)
 - Purpose:
 - Facilitate Transition to Unleaded Replacement Avgas with Least Impact on Existing Fleet
 - Primary Objective is FAA Issuance of Fleet-Wide Approval for Most Viable Replacement(s)
 - Status & Milestones:
 - 5-Year Program Under Way and Funded by Congress & Industry Contributions
 - July 2014: 9 candidate fuels from 5 offerors have entered the program
 - Sept. 2014: Qualified Fuels to Enter Phase 1 Evaluation
 - Jan. 2016: Qualified Fuels to Enter Phase 2 Evaluation
 - Dec. 2018: Final Fuel(s) Complete PAFI Testing to Support Fleet-Wide Approval
- EPA Regulatory Activity Aligned with PAFI Schedule
 - Transition Based on Viable Replacement
- Supply of current leaded avgas remains stable

Background

Where have we been.

Path To Unleaded Avgas – Where we Are



PAFI

Piston Aviation Fuels Initiative

Where we are, where are we going, how we will get there.

PAFI Mission

“The mission of PAFI is to evaluate candidate unleaded replacement fuels and identify those fuels best able to technically satisfy the needs of the existing aircraft fleet while also considering the production, distribution, cost, availability, environmental and health impacts of those fuels.”

PAFI Mission Continued

“PAFI was conceived and established to overcome... barriers to entry into the aviation fuel marketplace by creating a process that would evaluate all of the properties and conditions necessary for broad production, distribution and usage of a new unleaded aviation fuel, and expeditiously develop data necessary to support FAA approval of the majority of the existing fleet of piston aircraft to operate on that fuel.”

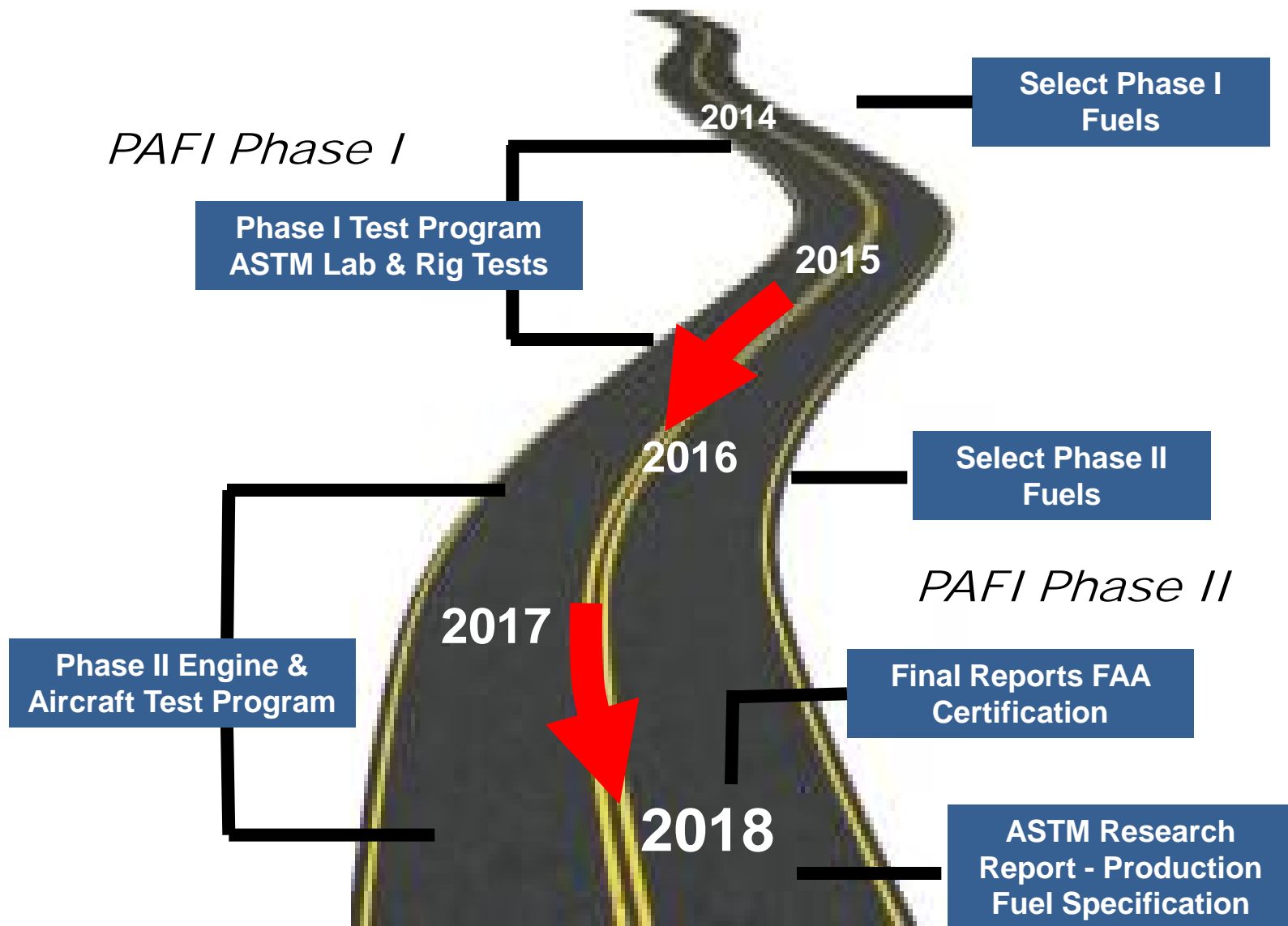
Piston Aviation Fuels Initiative

Overview

PAFI is a robust joint government/industry initiative established at the request of a broad cross section of the aviation and petroleum industries and consumer representatives

- Formed pursuant to the recommendations of the UAT ARC Final Report
- Process for the identification, evaluation and deployment of the most promising unleaded replacements for 100LL avgas
 - technically satisfy the needs of the existing aircraft fleet
 - considers production, distribution, cost, availability, environmental and health impacts
- Goal is data to support FAA **fleetwide approval** and ASTM specification

Path To Unleaded Avgas – Where We Are Going



FAA SIR DTFACT-13-R-00015

Industry Unleaded AVGAS proposals received July 1, 2014

- ✓ Afton Chemical Company
- ✓ Avgas LLC
- ✓ Consortium of BP, TOTAL, & Hjelmcoco
- ✓ Shell
- ✓ Swift Fuels

PAFI Steering Group (PSG)

Purpose

- ✓ Facilitates, coordinates, expedites, promotes, and oversees the PAFI program
- ✓ Coordinates resources and support necessary to execute the program
- ✓ Engages industry stakeholders for allocation of expertise and resources to support task groups and the PAFI test program

Members

AOPA – Aircraft Owners and Pilots Association

API – American Petroleum Institute

EAA – Experimental Aircraft Association

GAMA – General Aviation Manufacturers Association

NATA – National Air Transportation Association

NBAA – National Business Aircraft Association

FAA - Federal Aviation Administration

PAFI Steering Group (PSG) Cont'd

Management

- FAA Co-Lead (Peter White)
 - Manager of FAA Fuels Program Office AIR-20
 - Serves as FAA program manager
 - Monitors, directs, and coordinates overall government related PAFI activities
- Industry Co-Lead (Ron Wilkinson)
 - Reports to the PSG
 - Serves as the industry Program Manager
 - Interfaces with Industry, FAA, and fuel developers
- See following link for further information on PAFI
http://www.faa.gov/about/initiatives/avgas/org_info/

PAFI Support Groups

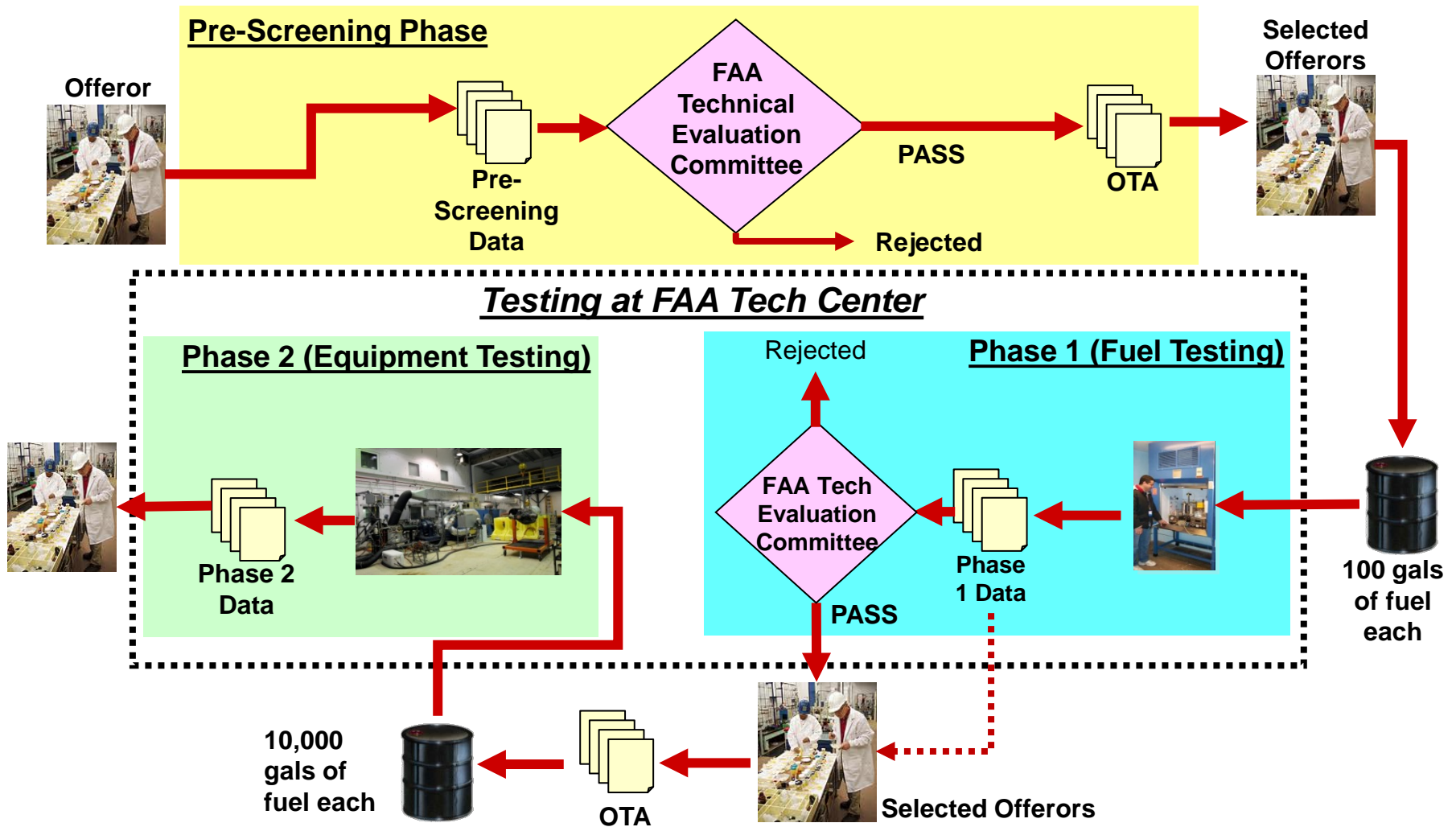
● Technical Advisory Committee (TAC)

- Reports to PAFI Steering Group (PSG)
- Membership represents aviation product and fuel manufacturers
- Venue to provide industry “in-kind” support – technical and equipment

● Technical Evaluation Committee (TEC)

- Reports to FAA
 - FAA consultants and employees vetted for COI within areas of expertise necessary to evaluate fuels to criteria
 - Responsible for Phase I fuel evaluation & selection
 - Responsible for Phase II fuel evaluation & selection
- Distinct and Separate Support Groups with **NO** interconnections

FAA Technical Center's Role in PAFI Test Program



PAFI Accomplishments

The following accomplishments reflect actions implemented pursuant to the recommendations of the UAT ARC final report.

- FAA AIR-20 Fuels Program Office and the AIR-21 Certification Office were created in 2012 .
- PAFI Steering Group (PSG) was formed in 2013
- Screening Information Request (SIR) released by the FAA in June 2013
- A **Technical Evaluation Committee (TEC)** was formed to evaluate proposals submitted by industry in response to the SIR
- A **Technical Advisory Committee (TAC)** was formed and is fully operational having convened its first meeting June 23rd and again on July 21st
- A PAFI master schedule/plan has been developed
- Nine proposals were received in response to the SIR on July 1st
 - 5 industry respondents for candidate unleaded fuels
- The FAA TEC was convened the week of July 14 to begin the review of proposals received for unleaded fuels

Near Term Milestones

- FY2014 significant milestones
 - ✓ July 1 - submittal of prescreening data in response to the SIR
 - ✓ Sept 1 - FAA request for Phase I fuels
 - ✓ Nov 1 - delivery of Phase I fuels to the FAA Tech Center for testing
- FY2016 significant milestones
 - ✓ Jan 30 - FAA request for Phase II fuels
 - ✓ July 30 - delivery of Phase II fuels to the FAA Tech Center

PAFI Test Program

FAA William J. Hughes Technical Center

FAA Technical Center Test Program

Phase I – Lab Tests, Emissions & Toxicology Assessments

Work Product – Evaluation of candidate fuels for potentially show stopping issues

- Chemical makeup
- Performance properties
- Establish credible and peer-reviewed test protocols for ascertaining necessary fit-for-purpose data
- Fit for purpose testing across the ranges allowed by the fuel formulations (worse case formulations)
- Evaluate emissions and toxicology properties
- Data from Phase 1 will be used to evaluate the business case for candidate fuel production, distribution and availability to consumers

FAA Technical Center Test Program

Phase II – Full Scale Engine & Aircraft Testing

Work Product – Data packages from full scale engine & aircraft testing which support ASTM & FAA Approval

- Fuels will be tested at the engine and aircraft level to evaluate their suitability across as much of the existing fleet as possible
- Consists of an integrated engine and aircraft test program testing multiple fuels in multiple engines and multiple aircraft
- Data collected from this testing will generate data that can be used to support the fleet wide approval of aircraft and engines including the orphaned fleet no longer supported by a manufacturer. This program is the most viable path to a fleet wide approval of new fuel formulations
- Data from the Phase I and Phase II testing will also be submitted for ASTM Production Specification, which will enable the fuels to be accepted in the marketplace in an orderly and comprehensive manner. FAA involvement in this step will ensure acceptance and adoption of the fuel with consumers and across the petroleum and aviation industry.

Fleet Wide Approval

Fleet Wide Approval

- Fleet wide approval is the PRIMARY GOAL OF PAFI
 - ✓ Concept provides approval for use of new unleaded AVGAS in transparent fleet of engine and aircraft models
 - ✓ FAA is currently working to identify possible approaches
- Approach and implementation is fuel dependent
 - ✓ Fuel properties & composition
 - ✓ Impact on engine and aircraft models
- PAFI data packages will support fleet wide approval for the specific fuel/s at completion of Phase 2

PAFI Funding

PAFI Funding

- President's Budget Request Shows Full Funding for Unleaded Avgas Program through 2018
 - ✓ Annual FY Budget Request Approx \$5-6 million
- Congress has authorized \$6 million in fiscal year 2014
 - ✓ Funding supports the PAFI test program at the FAA William J. Hughes Technical Center
- Industry In-Kind Support
 - ✓ Fuel development and supply for testing program
 - ✓ Technical expertise for qualification and testing methods
 - ✓ Equipment and services for test program

PAFI Takeaway Points

- ✓ Robust industry-government collaborative initiative
- ✓ Strong support from key stakeholders
- ✓ Broad and in depth knowledge base available through the industry technical advisory committee and steering group
- ✓ FAA Tech Center as a primary independent test resource
- ✓ Nine proposals for unleaded AVGAS submitted by five organizations
- ✓ Purpose: Identify the most viable replacement that can best satisfy the needs of the existing aircraft fleet with least impact
- ✓ Considers the production, distribution, cost, availability, environmental and health impacts
- ✓ Centralized FAA certification
- ✓ Goal of Fleet wide approval

Conclusion

“Ultimately it is everyone’s goal that the piston aviation fleet moves efficiently and economically to a viable and safe unleaded future. The PAFI program provides a sound process to ensure that this goal is achieved with a minimum of disruption to the general aviation industry and with the greatest likelihood of marketplace success.”

Reference PAFI Whitepaper Nov 2013

Piston Aviation Fuel Initiative Links

FAA PAFI Website

<http://www.faa.gov/about/initiatives/avgas/>

FAA Contracts SIR Link

<https://faaco.faa.gov/index.cfm/announcement/view/15840>

FAA Press Release July 10, 2014

http://www.faa.gov/news/press_releases/news_story.cfm?newsId=16594

End of Presentation

Questions

Alternate Slides

Environmental Considerations

Environmental Considerations

Clean Air Act (CAA)

- EPA has the authority to establish emissions standards and related requirements for aircraft engine emissions
- EPA must consult with the FAA in establishing these standards
 - Standards should take into account technological feasibility and must not significantly increase noise or adversely affect safety
- Emissions standards are enforced by FAA through aircraft and engine certification

Note.....There are currently no active or planned exhaust gas emission standards applicable to aviation reciprocating engines. On the other hand, turbine aviation engines are subject to emission standards.

Summary

Environmental Considerations

- The EPA has not proposed to ban leaded AVGAS
- The EPA are at the first step of a long process and have made no decisions
- EPA is committed to working closely with FAA, States, Industry and user groups to keep piston-engine aircraft flying in an environmentally acceptable and safe manner throughout the U.S.
- The EPA cannot take unilateral action (nor does it desire to) ban lead without FAA and public involvement