PAFI
Piston Aviation Fuels Initiative

Program Overview & Status

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Presenters

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PAFI Program Briefing Outline

- Intent of PAFI & Test Program
- FAA Technical Center Test Program
- PAFI Advantages
- Collaboration With Fuel Developer
- Offeror Generated Data
- Fleet Wide Approval
- PAFI Steering Group (PSG)
- PAFI TAC vs TEC
- SIR Milestones
- Master Schedule
- Overview of Industry Questions
- Industry Questions

Intent of PAFI & Test Program

- Ref FAA UAT ARC Final Report Sect 4.6.2……."*Consequently, great efficiencies could be realized by developing* ***one portfolio of tests that could provide data to support both the ASTM process and FAA certification process****. This requires that the new ASTM Standard Practice and the FAA regulations and guidance be reviewed to identify where common tests and/or analyses can satisfy both sets of requirements. Test procedures will then be developed for both the common tests and unique tests for use by the FAA Tech Center under the centralized testing concept."*

- Results of Phase II testing will be documented in reports containing data that will be used to support ASTM Production Specification and FAA fleet wide approval

FAA Technical Center Test Program

Phase I

Evaluates 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

- Fuels to be tested at the engine and aircraft level to evaluate their suitability across as much of the existing fleet as possible
- 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 can 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.

PAFI Advantages

ADVANTAGES

- ✓ Fleet wide approval
- ✓ Industry support from key stakeholders through TAC
- ✓ Centralized FAA certification
- ✓ Standardized test protocols for ASTM and FAA
- ✓ FAA Tech Center as a primary test resource
- ✓ Broad and deep knowledge base available through the TAC and PSG
- ✓ Vetting of fuel for environmental & toxicology aspects
- ✓ Preparation of ASTM & FAA data packages (Phase II)
- ✓ Deployment planning & coordination
- ✓ PAFI offers a conduit for government information sharing, e.g. relative to possible EPA/FAA regulatory activity

PAFI Collaboration with Fuel Developers

Communications

- During the period preceding Phase I selection, PAFI communications with fuel developers are subject to FAA contractual requirements governing competitive procurement processes
- Once a fuel developer is operating under a FAA CRADA (Cooperative Research & Development Agreement), the CRADA agreement will provide for communications and data exchanges
- The goal is an open and ready exchange of information

Offeror Generated Data

Fuel Developer Supplemental Data

- In some cases a fuel developer may have generated supplemental data packages in advance of or independent of the PAFI program
- Use of supplemental data packages is dependent on the applicability and validity of the data relative to the defined test program
  - ✓ The intent of PAFI is not to duplicate valid and relevant test data
- Test protocols for Phase 1 and Phase 2 are not yet developed, so applicability of applicant test data will need to be assessed on a case-by-case basis

Fleet Wide Approval

Fleet Wide Approval

- Fleet wide approval is the PRIMARY GOAL OF PAFI
- FAA is currently identifying mechanisms to accommodate fleetwide approvals
- Plan and implementation is fuel dependent
  - ✓ Fuel properties & composition
  - ✓ Impact on engine and aircraft models
- Concept of fleet wide approval consists of a plan providing approval for use of new unleaded AVGAS in transparent fleet of engine and aircraft models
- PAFI data packages will support the fleet wide approval plan for the specific fuel at completion of Phase 2

PAFI Steering Group (PSG)

Purpose

Facilitate, coordinate, expedite, promote and oversee the Piston Aviation Fuels Initiative (PAFI) based on the recommendations of the UAT ARC Final Report

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

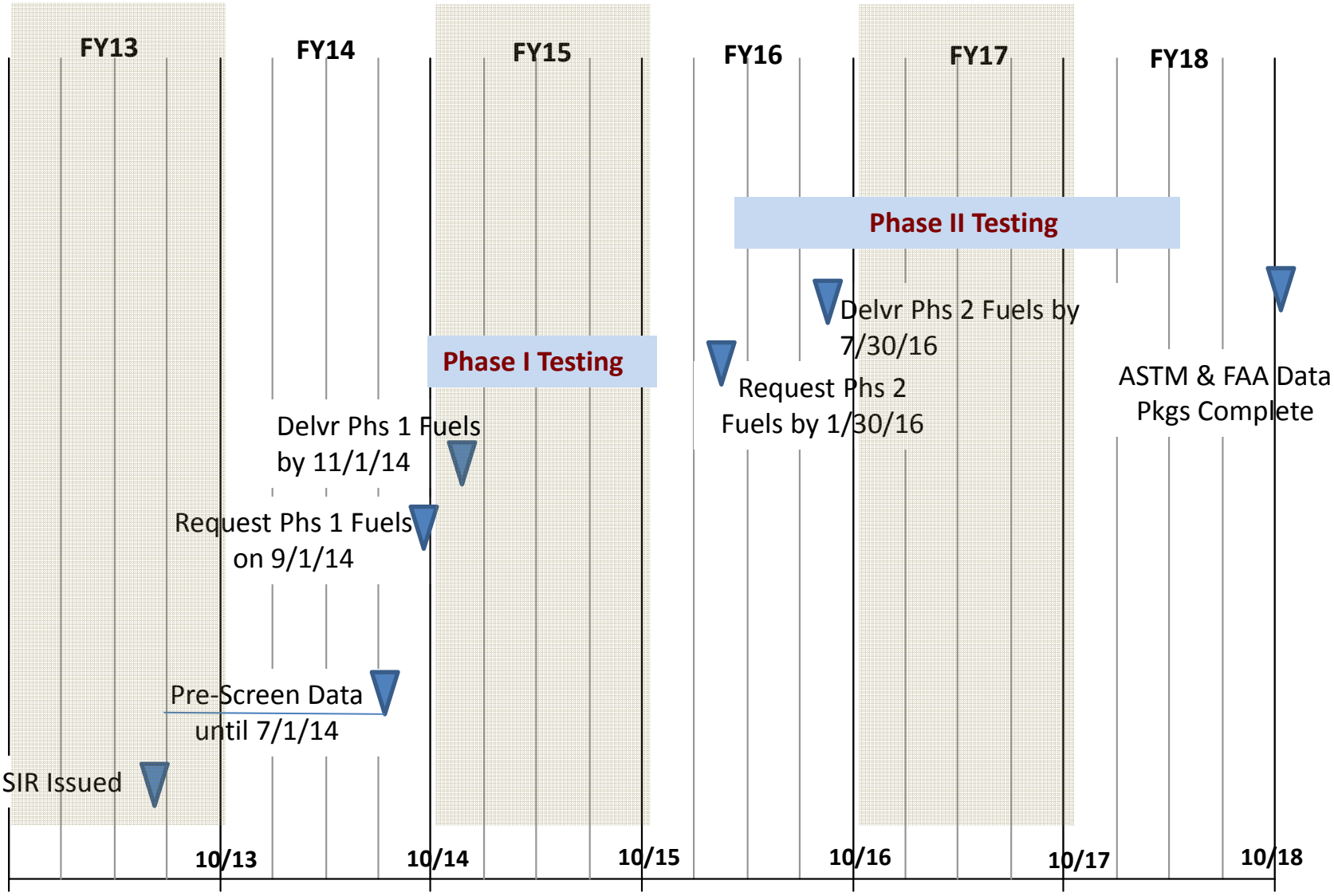
FAA - Federal Aviation Administration

PAFI TAC vs TEC

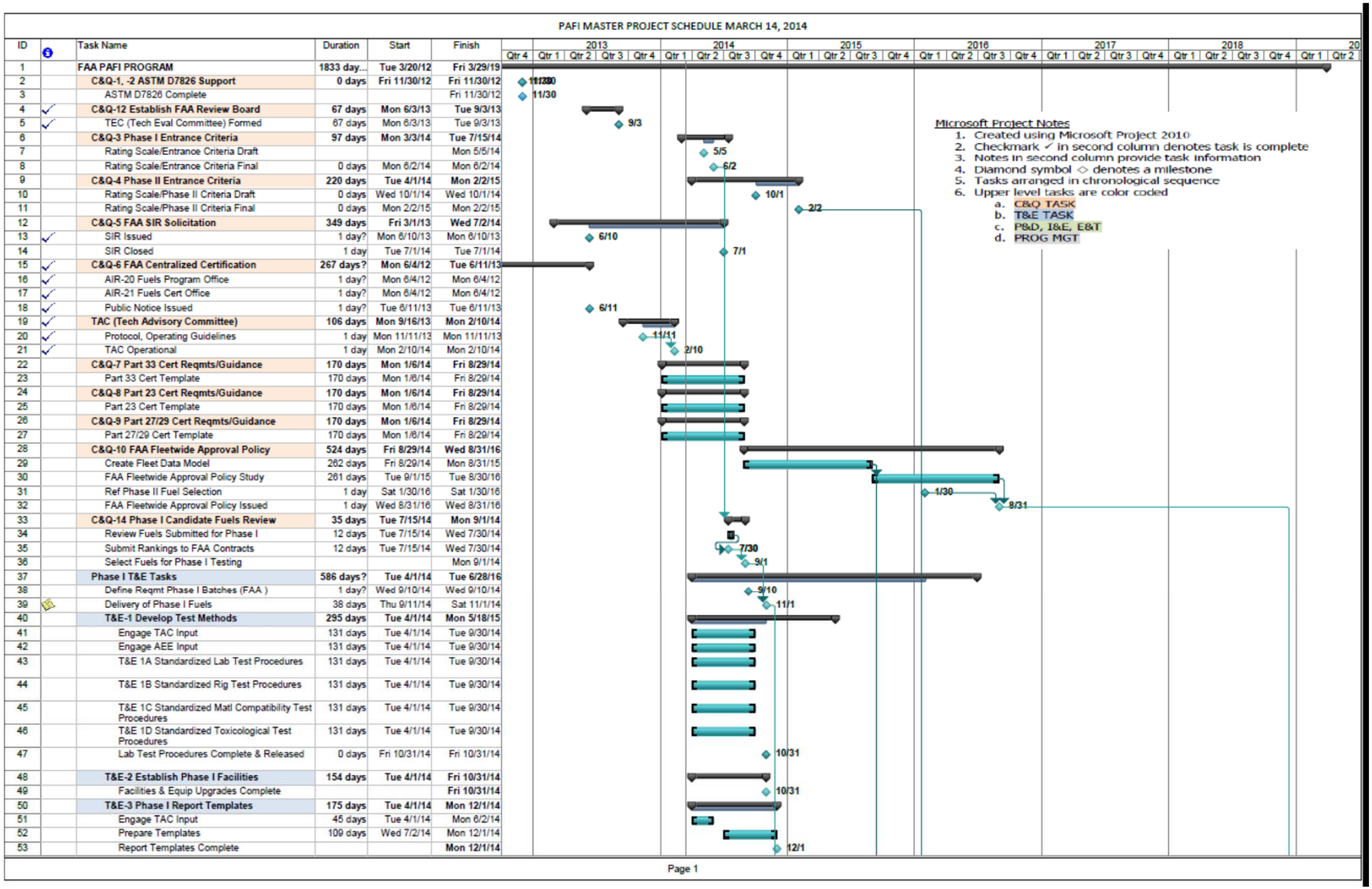
TAC vs TEC

- Distinct and Separate Support Groups with **NO** interconnections
- **Technical Advisory Committee (TAC)**
  - **Reports to PAFI Steering Group (PSG)**
  - Representatives from aviation product and fuel manufacturers
  - Venue to provide industry "in-kind" support – technical and equipment
  - NO involvement in TEC or fuel selection
- **Technical Evaluation Committee (TEC)**
  - **Reports to FAA –** FAA consultants and employees vetted for COI with areas of expertise to evaluate fuels to selection criteria
  - Evaluates fuel proposals furnished in response to the SIR
  - Responsible for Phase I fuel selection
  - Responsible for Phase II fuel selection
  - NO involvement in TAC

PAFI SIR Milestones



PAFI Master Schedule



ID	Task Name	Duration	Start	Finish
1	**FAA PAFI PROGRAM**	**1833 day...**	**Tue 3/20/12**	**Fri 3/29/19**
2	**C&Q-1, -2 ASTM D7826 Support**	**0 days**	**Fri 11/30/12**	**Fri 11/30/12**
3	ASTM D7826 Complete			Fri 11/30/12
4	**C&Q-12 Establish FAA Review Board**	**67 days**	**Mon 6/3/13**	**Tue 9/3/13**
5	TEC (Tech Eval Committee) Formed	67 days	Mon 6/3/13	Tue 9/3/13
6	**C&Q-3 Phase I Entrance Criteria**	**97 days**	**Mon 3/3/14**	**Tue 7/15/14**
7	Rating Scale/Entrance Criteria Draft			Mon 5/5/14
8	Rating Scale/Entrance Criteria Final	0 days	Mon 6/2/14	Mon 6/2/14
9	**C&Q-4 Phase II Entrance Criteria**	**220 days**	**Tue 4/1/14**	**Mon 2/2/15**
10	Rating Scale/Phase II Criteria Draft	0 days	Wed 10/1/14	Wed 10/1/14
11	Rating Scale/Phase II Criteria Final	0 days	Mon 2/2/15	Mon 2/2/15
12	**C&Q-5 FAA SIR Solicitation**	**349 days**	**Fri 3/1/13**	**Wed 7/2/14**
13	SIR Issued	1 day?	Mon 6/10/13	Mon 6/10/13
14	SIR Closed	1 day	Tue 7/1/14	Tue 7/1/14
15	**C&Q-6 FAA Centralized Certification**	**267 days?**	**Mon 6/4/12**	**Tue 6/11/13**
16	AIR-20 Fuels Program Office	1 day?	Mon 6/4/12	Mon 6/4/12
17	AIR-21 Fuels Cert Office	1 day?	Mon 6/4/12	Mon 6/4/12
18	Public Notice Issued	1 day?	Tue 6/11/13	Tue 6/11/13
19	**TAC (Tech Advisory Committee)**	**106 days**	**Mon 9/16/13**	**Mon 2/10/14**
20	Protocol, Operating Guidelines	1 day	Mon 11/11/13	Mon 11/11/13
21	TAC Operational	1 day	Mon 2/10/14	Mon 2/10/14
22	**C&Q-7 Part 33 Cert Reqmts/Guidance**	**170 days**	**Mon 1/6/14**	**Fri 8/29/14**
23	Part 33 Cert Template	170 days	Mon 1/6/14	Fri 8/29/14
24	**C&Q-8 Part 23 Cert Reqmts/Guidance**	**170 days**	**Mon 1/6/14**	**Fri 8/29/14**
25	Part 23 Cert Template	170 days	Mon 1/6/14	Fri 8/29/14
26	**C&Q-9 Part 27/29 Cert Reqmts/Guidance**	**170 days**	**Mon 1/6/14**	**Fri 8/29/14**
27	Part 27/29 Cert Template	170 days	Mon 1/6/14	Fri 8/29/14
28	**C&Q-10 FAA Fleetwide Approval Policy**	**524 days**	**Fri 8/29/14**	**Wed 8/31/16**
29	Create Fleet Data Model	262 days	Fri 8/29/14	Mon 8/31/15
30	FAA Fleetwide Approval Policy Study	261 days	Tue 9/1/15	Tue 8/30/16
31	Ref Phase II Fuel Selection	1 day	Sat 1/30/16	Sat 1/30/16
32	FAA Fleetwide Approval Policy Issued	1 day	Wed 8/31/16	Wed 8/31/16
33	**C&Q-14 Phase I Candidate Fuels Review**	**35 days**	**Tue 7/15/14**	**Mon 9/1/14**
34	Review Fuels Submitted for Phase I	12 days	Tue 7/15/14	Wed 7/30/14
35	Submit Rankings to FAA Contracts	12 days	Tue 7/15/14	Wed 7/30/14
36	Select Fuels for Phase I Testing			Mon 9/1/14
37	**Phase I T&E Tasks**	**586 days?**	**Tue 4/1/14**	**Tue 6/28/16**
38	Define Reqmt Phase I Batches (FAA)	1 day?	Wed 9/10/14	Wed 9/10/14
39	Delivery of Phase I Fuels	38 days	Thu 9/11/14	Sat 11/1/14
40	**T&E-1 Develop Test Methods**	**295 days**	**Tue 4/1/14**	**Mon 5/18/15**
41	Engage TAC Input	131 days	Tue 4/1/14	Tue 9/30/14
42	Engage AEE Input	131 days	Tue 4/1/14	Tue 9/30/14
43	T&E 1A Standardized Lab Test Procedures	131 days	Tue 4/1/14	Tue 9/30/14
44	T&E 1B Standardized Rig Test Procedures	131 days	Tue 4/1/14	Tue 9/30/14
45	T&E 1C Standardized Matl Compatibility Test Procedures	131 days	Tue 4/1/14	Tue 9/30/14
46	T&E 1D Standardized Toxicological Test Procedures	131 days	Tue 4/1/14	Tue 9/30/14
47	Lab Test Procedures Complete & Released	0 days	Fri 10/31/14	Fri 10/31/14
48	**T&E-2 Establish Phase I Facilities**	**154 days**	**Tue 4/1/14**	**Fri 10/31/14**
49	Facilities & Equip Upgrades Complete			Fri 10/31/14
50	**T&E-3 Phase I Report Templates**	**175 days**	**Tue 4/1/14**	**Mon 12/1/14**
51	Engage TAC Input	45 days	Tue 4/1/14	Mon 6/2/14
52	Prepare Templates	109 days	Wed 7/2/14	Mon 12/1/14
53	Report Templates Complete			Mon 12/1/14

Overview Industry Questions

Industry questions to date reflect interest in the following areas

- PAFI Planning, Processes, & Technical Aspects
- SIR Requirements & Evaluation Process
- Fleet Wide Approval

Q & A (1)

- Q - The solicitation advises that its goal is "*to solicit candidate unleaded avgas formulations for testing to identify the most viable replacements for the existing 100LL avgas with the least impact on the existing fleet of piston aircraft and fuel availability*". Given the limited resources and urgency being expressed on the need to identify a replacement. **How many fuels do you consider the FAA has the capability to identify and if more than one is it proposed that the solicitation address the significant concerns of comingling** of the new likely types of formulae that will be our post-avgas fuels?

- A - The SIR does not specify any number of fuels. For planning and budget purposes, the program was built around, but is not limited to, ten fuels for the Phase 1 evaluation and two fuels for the Phase 2 evaluation. There is flexibility in the plan that would allow for quantity adjustments in both Phases 1 and 2. We are seeking the most viable fuels and the intent is to evaluate all potentially viable fuels that are determined to have the least impact on the fleet. Comingling evaluation is planned as part of the Phase 1 program. Such Phase 1 testing will be the evaluation of mixes of an offeror's fuel and 100LL. In that comingling could impact the post-program adoption of fuels exiting Phase 2, it is anticipated that a more rigorous evaluation of the comingling will be undertaken on the smaller quantity of Phase 2 fuels.

Q & A (2)

- Q - We know our industry is keen to achieve replacement for Avgas as soon as possible. **The SIR appears to be able to allow fuels to progress into phase 2 earlier than 2016 (at least by 1st April 2015)** given they are able to demonstrate a more mature state of readiness and to have its performance verified. Can you confirm this is the case and will the SIR be modified formally to reflect this important detail?

- A - The SIR does indeed allow us to request fuels for entry into Phase 2 as early as April 2015. Therefore the SIR does not need to be modified to reflect this. If fuels accepted into Phase 1 have an extensive data package that is evaluated and deemed to meet Phase I data requirement, it is the intent of the FAA to consider utilizing such test data. If it turns out that offeror-provided data does allow PAFI to accelerate the test program, the SIR has the flexibility to accommodate that. It is worth noting, however, that the current PAFI test program schedule is quite aggressive. Flexibility to accelerate the program was built into the SIR, but the makeup of the fuels submitted will have a large impact on the Phase 1 and Phase 2 test program, and will strongly influence our path forward, and therefore our ability to alter the currently anticipated test schedule.

Q & A (3)

- Q - More recent available information on fuel development programs suggest that at least one fuel has a state of readiness significantly in advance of that apparently assumed by the SIR. **In what ways will the SIR be modified to reflect current states of readiness?**

- A - The ultimate objective of the SIR is to provide technical data to support both ASTM specification development and FAA fleetwide certification. Therefore, even a fuel with an existing ASTM specification will still need to be tested to generate the data necessary to support the FAA fleetwide certification approval. As noted above, the SIR already allows the FAA significant flexibility in when the various Phases will take place. It is the intent of the program to perform some minimum set of tests in both Phases 1 and 2 to provide validation of offeror data and to ensure standardized comparable data in critical areas. Currently we do not see a need to modify the SIR. However, if programmatic changes beyond those currently afforded by the SIR are indicated, we will incorporate needed changes and post such changes in a revised SIR on the FAA contracting website.

Q & A (6)

- Q - I note the ARC states - a selection process will need to be established in order for FAA to select a limited number of the most promising fuels for testing. **What will be the criteria used for selection of fuels as they move from phase 1 to phase 2. in the SIR phases?**

- A - The entrance criteria for Phase 1 and 2 are published in the SIR. Phase 1 data will evaluated to select candidate Phase 2 fuels based on the selection criteria published in the SIR. The TEC will again develop an evaluation plan for Phase 2 and utilize this plan to select the fuels with the least impact on the current piston engine fleet. Note that the offeror may update their preliminary feasibility assessment prior to Phase 2 evaluation, based on the Phase 1 data.

<u>Criteria</u>

Factor 1: Fuel Properties and Performance

Fuel Performance, Aircraft Engine Performance, Rig/Component Testing, Materials Compatibility

Factor 2: Fuel Deployment Feasibility

Impact on Existing Aircraft Fleet, Environmental Impact of the Candidate Fuel, Fuel Definition and Control, Producibility and Cost of Candidate Fuel, Impact on Existing Avgas Distribution Infrastructure

Q & A (8)

- **Q - Fleet Wide Certification/Approval**: The UAT ARC recommends the FAA develop specialized policy and procedures to facilitate the most efficient approach possible for fleet-wide approval of aircraft and engines to use a new aviation gasoline and calls for a replacement fuel for leaded aviation gasoline being available by 2018. Others have said that the approval process should be achievable in 3-4 years from now.
  - What is FAA view of when fleet-wide certification is possible?
  - What will be process and key milestones for achieving fleet wide certification?
  - When can you confirm that this approval will be completed by the FAA?

- A - The FAA considers the development of a fleet-wide certification plan to be a critical element of the PAFI process. The extent of the fleet that will be covered by "fleetwide certification" will be dependent upon the fuel properties, composition, and fleet impact, as determined by the Phase 1 and Phase 2 test programs. We recognize that each fuel exiting Phase 2 may require a unique fleetwide approval plan. The level of similarity or deviation of the unleaded fuels to 100LL will drive both the impact on the fleet and the available fleetwide certification options. We will be better able to identify and develop available options when we know the properties and compositions of the fuels that are accepted into Phase 1. We will provide a fleetwide certification data package and process for each fuel as an output of the Phase 2 test program – currently scheduled to complete not later than 2018.

Q & A (9)

- Q - The complexity of the technical challenge for Fleet Wide Certification appears to recommend the PAFI program have access to a wide range of experts. We note that some UAT ARC member organization have been excluded from the TAC while arguably almost every sitting member has a vested interest in the decisions taken. **Will TAC participation be reviewed in near future for increased inclusiveness?**

- A - The TAC consists of a diverse group of industry members chosen by the FAA including OEM product manufacturers and other key stakeholders who can be called upon to provide "in-kind" support in the form of Subject Matter Experts (SME's) as need to support specific PAFI tasks. In addition, TAC members may be requested to furnish "in-kind" support in the form of materials, equipment or services. Due to the competitive nature of the SIR solicitation as governed by FAA contractual and legal guidelines, inclusion on the TAC of a representative from a respondent to the SIR poses a potential conflict of interest relative to those respondents not represented on the TAC, or could create the appearance of a conflict of interest. It is our intent to invite all participants in Phase 1 and 2 to participate in the TAC. As indicated on the FAA Website, the current TAC membership represents an initial listing and is subject to change as the program progresses. Availability of the TAC is crucial to the ultimate success of the program. PAFI management will continue to monitor the TAC for necessary adjustments as may be required to meet program needs. **NOTE: The FAA takes the conflict of interest principle very seriously and the process will be carefully monitored by the Contracting Officer and the FAA's legal office. Any questions presented by the evaluation team for TAC consideration will go through the Contracting Officer, to ensure responses to same will not prejudice/unfairly benefit any offeror.**

Q & A (13)

- Q - There is likely to be some sensitive intellectual property. How is that going to be handled? It can sometimes take years for a patent to issue. And the holder of the IP may want to revise the scope of the patent work late in the process - - and any earlier public disclosures would possibly prevent that follow on intellectual property protection.

- A - The members of the Technical Evaluation Committee (TEC) that evaluate the proposals have been vetted for Conflict of Interest and will have signed Non-Disclosure Agreements. Per the FAA Employee Code of Conduct, FAA employees (i.e. the employees in AIR-20 and at the FAA Tech Center) must safeguard proprietary information. Offerors should clearly mark their data as appropriate, and FAA procedures require checking with the owner of the data before the release of any information. As candidate fuels are accepted for entry into the various phases of the test program, agreements will be signed which will address the safeguarding of proprietary information, and will include provisions regarding when data can be made public. All the provisions of the agreements for Phase 1 and Phase 2 will be understood before any offeror commits to participate.

Q & A (15)

- Q - Impact on the fleet - - how will cost verses % of fleet that can use (cannot use) the fuel be weighed such as deviation from historic deviation properties?

- A - The SIR includes a requirement for submittal of a Business Plan, which should address the issues of cost and % of fleet that can use the fuel. Cost and fleet applicability are just two of the criteria that will be used in the assessment of fleet impact. The TEC has been established and is in the process of finalizing the Evaluation Plan for candidate fuels for entry into Phase 1. The Evaluation Plan will have grading criteria for each of the individual core elements contained in the SIR and each of these individual grades will be combined for an aggregate grade of each submitted fuel. The reviewers will make use of the offeror's Business Plans and other data submitted in the data package when grading the proposals for fleet impact.

Q & A (17)

- Q - How will low levels of toxicity be evaluated? Compared to TEL? Or otherwise?

- A - We are going to compare candidate fuels relative to 100LL and other conventional transportation fuels. The goal is to remove lead due to environmental concerns. Any new fuel formulation should not present toxicological or environmental risks. Environmental impact is an evaluation element in the Phase 1 selection process and it is not anticipated that the evaluation will be limited solely to comparisons to TEL toxicity.

Q & A (18)

- Q - Will any toxicity level that is less severe than TEL be deemed acceptable ?

- A - Fuels can present other hazards besides lead emissions. We will strive to make the best, informed decision that we can with regard to potential safety, environmental, and toxicology risk associated with the fuel. The details of the evaluation criteria for environmental impact are currently being developed. As background, in the 1990's MTBE was introduced into automotive fuels as an oxygenate. It was then found to contaminate ground water, and it was banned by many states. We don't want the piston engine aircraft industry to be challenged with changing future aircraft fuel formulations due to environmental or toxicology concerns, such as those posed by MTBE or the current addition of TEL.