Annex 3
Industry Up-Date

Unleaded Avgas
CAA, Gatwick, UK
25th September 2012

ASTM, CRC & Europe

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Agenda

- Introduction
- ASTM
  - Reduced Lead / Unleaded Grades.
  - Additional Grades.
  - Test Protocols/Guidelines.
- CRC
  - Technical Research.
- Europe
  - Avgas
  - Environmental / HSE

Introduction

- Avgas lead content remains a key issue for the piston engine aviation Industry:
  - 2006 'Bluewater Petition' (2006)
  - 2008 National Ambient Air Quality Standards - 90% reduction in Pb from 1.5 to 0.15 micrograms/m^3
  - 2010 Draft 'Endangerment Finding' relating to airborne lead sent to the White House for review.
  - 2010 EPA issue "Advance Notice of Proposed Rulemaking on Lead Emissions from Piston-Engine Aircraft Using Leaded Aviation Gasoline" (the "ANPR") 75 Fed. Reg. 22440. www.epa.gov/otaq/aviation.htm
  - 2010 Lead monitoring at selected airports.
  - 2011 FAA/Industry Unleaded Avgas Transition Aviation Rulemaking Committee (ARC) formed.
  - 2012 UAT ARC report issued – 2018 set for unleaded Avgas suitable for majority of fleet: http://www.faa.gov/about/initiatives/avgas/
  - 2012 European Chemicals Agency – TEL 'high concern': http://echa.europa.eu/en/news-and-events/news-alerts

ASTM

The Industry have already developed a number of reduced lead and unleaded Avgas Grades through ASTM:

- Reduced lead Avgas Grades:

  2011 ASTM D910 up-dated to include a 'very low lead' Grade 100VLL (0.45 gPb/l maximum).
- Unleaded Avgas Specifications:

  ASTM D6227 UL82, UL87 / ASTM D7547 UL91.
- Blending component quality control:

  ASTM D7618: ETBE purity for ASTM D6227 Avgas.

  ASTM D7796: ETBE purity GC test method.

ASTM

Standard engine testing procedures have been developed together with guidelines to assess new fuels and additives:

- Engine testing procedures:
  ASTM D6424 / ASTM D6812
- Qualification and approval processes
  - 'D4054' Task Force – Testing guidelines for new Avgas formulations and additives to help ensure 'fit for purpose' – at final Ballot stage

Development of these procedures has been particularly challenging given the evolution of aviation piston engines and no 'drop in' replacement for high octane (Grade 100LL) Avgas.

ASTM

In addition, further proposals are in the pipe-line:

- Unleaded Avgas Test Fuels:
  ASTM D7592 UL94 / ASTM D7719 UL102
  - Commercial specifications proposed.

  - Next ASTM meeting:

2012 ASTM D02 Aviation Meeting
Sunday December 2 – Thursday December 6 2012
Norfolk Waterside Marriott,
Norfolk, VA, USA

www.ASTM.org

ASTM

Diesel Engines

- ASTM Task Force examining world jet fuel quality for compression ignition aviation piston engines:
  - Lubricity
  - Cetane quality
- Complex as Jet specification overseen by aviation turbine Industry:
  - focus must remain on turbine fuel properties.
  - unrealistic to segregate Jet specifically for diesel engines at GA airfields.
  - addition of additives to bulk storage (e.g. cetane improver) not viable.
- Engineering / Certification standards to resolve.

CRC

- CRC are supporting the Industry / ASTM initiative with technical research:
  - FAA Technical Centre – expertise/engine testing.
  - Dixie Laboratories – fuel properties (ASTM D910)
  - Industry members – OEMs, Producers, Regulators, Users.
  - Over 18 years expertise in unleaded Avgas development.

CRC

- Current CRC programme is to determine the minimum amount of lead for Avgas to match the anti-detonation performance of a base-line 100LL in a full size (Lycoming IO540k) aviation engine.
- Information will help Industry understand technical performance limit of any 'ultra low lead' Grade which may be proposed during the transition to unleaded Avgas: 100ULL.
- This, and other Avgas technical research, is reported at the CRC meeting:

2013 CRC Aviation Meetings:
Monday, April 29 - Thursday, May 2, 2013
Hyatt Regency
Savannah, GA

[Monday April 29th dedicated to Avgas]

www.crcao.com

Europe

- Avgas has remained stable in Europe while many changes have impacted ground fuels (e.g. Renewable Energy Directive)
  - Def Stan 91-90 Grade 100LL major product.
  - Managed by Aviation Fuels Committee (care of UK MoD).
  - Good alignment with ASTM D910.
- In addition unleaded fuels are available to satisfy customer/environmental concern:
  - Hjelmco 91/96UL™, D7547 UL91

Europe

- European pressure to raise the ethanol content of motor gasoline is increasing interest in unleaded Avgas from 'STC' aircraft owners.
- The European Chemicals Agency (ECHA) have announced a public consultation on 54 potential 'Substances of Very High Concern' (SVHC) including tetraethyllead (aviation gasoline octane enhancer), due to toxicity to reproduction.

http://echa.europa.eu/en/news-and-events/news-alerts

- European aviation industry is engaged with ASTM / CRC activities seeking an unleaded Avgas for the future.

Thank You