



**SAIB:** NE-09-25  
**Date:** May 1, 2009

**SUBJ:** Fuel: Jet Fuel Containing FAME (Fatty Acid Methyl Ester)

*This is information only. Recommendations aren't mandatory.*

## **Introduction**

This Special Airworthiness Information Bulletin (SAIB) provides guidance regarding the presence of **FAME (Fatty Acid Methyl Ester) in jet fuel** to owners and operators of turbine engine-powered aircraft and Aviation Safety Inspectors (ASIs) in Flight Standard District Offices (FSDOs) and Certificate Management Offices (CMOs). The aviation fuel community, which includes aircraft and engine manufacturers, as well as petroleum producers, has formally approved the use of aviation jet fuel containing less than 5 parts per million (ppm) (5 mg/kg) of FAME. This is currently included in the Def Stan 91-91 jet fuel specification and will be incorporated into the ASTM D1655 jet fuel specification. Aircraft and engine manufacturers have issued, or will shortly issue, service information describing operating and maintenance procedures for aircraft and engines that inadvertently operate with jet fuel containing 5 ppm to 30 ppm of FAME. A joint-industry working group is currently conducting an investigation to determine if operation with up to 100 ppm of FAME is acceptable. At this time, the airworthiness concern is not an unsafe condition that would warrant airworthiness directive (AD) action under Title 14 of the Code of Federal Regulations (14 CFR) part 39.

## **Background**

Jet fuel is typically transported in multi-product pipeline and distribution systems. The practice is efficient, practical, and environmentally sound. Quality assurance procedures for handling interfaces between products, together with laboratory testing requirements, are well established, and quality escapes are rare. However, recent mandates by government result in the shipment of biodiesel in multi-product pipelines and create the risk of cross-contamination of jet fuel with biodiesel components.

The bio-component in biodiesel, FAME, is a surface-active material. This means that in theory, it can adhere to pipe and tank walls as the biodiesel passes through, and then release from the walls into the following product, which may be jet fuel. Also, small amounts of diesel containing FAME remaining within distribution manifolds, tanks, vehicles, and pipes, can result in traces of FAME getting into jet fuel transported through the same components. At high enough concentrations, FAME can impact the thermal stability of the fuel that could lead to coke deposits in the fuel system. FAME contamination can also impact the freezing point of jet fuel resulting in gelling of the fuel. These conditions can result in engine operability problems, and possible engine flameout.

Jet fuel specifications are currently being updated to specify that levels of FAME in jet fuel below the detectable limit of 5 ppm are acceptable. Operation with jet fuel containing more than 5 ppm of FAME would not be in compliance with the aircraft and engine operating limitations, unless approved service information is issued with revised limitations to accommodate FAME levels greater than 5 ppm.

The aviation fuel industry Energy Institute (EI) established a Joint Inspection Project (JIP) to study the effects of FAME levels greater than 5 ppm in jet fuel. The group is analyzing jet fuel with 400 ppm of FAME to provide margin in the analysis. Preliminary data from this analysis indicates that

short-term operation with up to 30 ppm of FAME does not pose a risk to safety of flight. This data will be used by aircraft and engine type certificate (TC) holders to obtain approval to issue service information describing operating and maintenance procedures for aircraft and engines that inadvertently operate with jet fuel containing greater than 5 ppm, but less than 30 ppm of FAME. The ultimate objective of the working group is to develop data to support short-term operation at levels up to 100 ppm of FAME in jet fuel.

## **Recommendations**

We recommend that owners and operators of turbine engine-powered aircraft do the following:

1. Incorporate service information from aircraft and engine TC holders regarding FAME levels in jet fuel, into their operating specifications.
2. Contact their fuel suppliers to verify they have implemented quality control and inspection procedures to ensure fuel they deliver does not contain more than 5 ppm of FAME.
  - a. Quality control procedures relating to FAME contamination can be found in Joint Inspection Group (JIG) Bulletin No. 15, “Transport of Biodiesel in Multiproduct Pipelines”, dated November 2007, and Bulletin No. 21, “Risk of Contamination of Aviation Kerosene (Jet Fuel) with Biodiesel”, dated November 2008.
  - b. FAME levels in jet fuel can be determined by a proposed test method recently published by the EI entitled “IP PM DY: Determination of fatty acid methyl esters (FAME), derived from bio-diesel fuel, in aviation turbine fuel — GC-MS with selective ion monitoring/scan detection method”, not yet dated.
  - c. FAME levels in jet fuel can also be determined by using company proprietary methods that have proven to provide accurate results. Two of these methods are the Shell Research Ltd Two-dimensional Gas Chromatography method and the BP GC-MS method.
3. Develop contingency plans and procedures with their fuel suppliers to ensure that, should a contamination event occur:
  - a. Owners, operators, and authorities are informed immediately.
  - b. FAME levels specified by the aircraft and engine TC holders are not exceeded.
  - c. Procedures to comply with the TC holder’s instructions are followed.
4. Consult the latest applicable industry documents on this issue published by organizations such as the Air Transport Association, International Air Transport Association, aviation fuel producers, and the JIG.

Additional background information is available in JIG Bulletin No. 16, “UK FAME Related Jet Fuel Product Quality Incident on 14<sup>th</sup> May 2008 – Briefing Note”, dated June 2008, and Bulletin No. 20, “Potential Contamination of Jet Fuel with Biodiesel – Industry Update”, dated October 2008.

## **For Further Information Contact**

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## **For Related Service Information Contact**

The Joint Inspection Group at: <http://www.jointinspectiongroup.org> and the Energy Institute at: <http://www.energyinstpubs.org.uk>.