



SAIB: NE-09-25R1

Date: August 19, 2009

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

This is information only. Recommendations aren't mandatory.

Introduction

This **Revised** 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. The FAA has determined that the performance properties of aviation turbine fuel are not impacted with up to 30 ppm of FAME under restricted, short-term usage. The FAA has approved data for use by aircraft and engine manufacturers without further review by the FAA for issuance of service information to permit operation with aviation turbine fuel containing 5 ppm to 30 ppm under restricted, short-term usage. This revision adds operating procedures and limitations for those aircraft and engines for which service information has not been issued. Manufacturer service information regarding FAME in jet fuel takes precedence over this SAIB in all cases. 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 5 ppm or more 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 of 5 ppm and greater.

The aviation fuel industry Energy Institute (EI) established a Joint Inspection Project (JIP) to study the effects of FAME levels 5 ppm and greater in jet fuel. The group is analyzing jet fuel with 400 ppm of FAME to provide margin in the analysis. The data generated to-date substantiates that short-term operation with up to 30 ppm of FAME does not pose a risk to safety of flight. This data was approved by the FAA and may be used by aircraft and engine type certificate (TC) holders to issue service information describing operating and maintenance procedures for aircraft and engines that inadvertently operate with jet fuel containing 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, if available, regarding FAME levels in jet fuel, into their FAA-approved maintenance program.
2. Incorporate the following recommendations into FAA-approved maintenance programs ONLY if service information is NOT available from the manufacturer. Manufacturer service information regarding FAME in jet fuel takes precedence over this SAIB in all cases.

FAME Level	Limitations ¹				Comments
	Aircraft En-route	Engines Operated on the Ground	Aircraft on ground (engines not yet operated)	Aircraft waiting to be fuelled	
Less than 5 ppm	None	None	None	None	Level within specification criteria
5 ppm to 30 ppm	Two uplifts ² of fuel containing FAME	Two uplifts of fuel containing FAME	Allow dispatch. Two uplifts of fuel containing FAME	Fuel aircraft and allow dispatch. Two uplifts of fuel containing FAME	Contact aircraft and engine manufacturer to determine subsequent maintenance actions or develop a return to service maintenance program and submit for FAA approval
Greater than 30 ppm	Divert immediately to suitable airport	Do not allow dispatch	Do not start aircraft or allow dispatch. Take action to ensure fuel in aircraft tanks is below 30 ppm FAME then apply requirements as defined for 5 ppm to 30 ppm.	Do not fuel aircraft. Take action to ensure fuel supply to aircraft is below 30 ppm FAME then apply requirements as defined for 5 ppm to 30 ppm.	Contact aircraft and engine manufacturer to determine subsequent maintenance actions or develop a return to service maintenance program and submit for FAA approval

¹ Based on operational status of aircraft at time of discovery of contamination.

² An uplift is defined as the transferring of fuel from a ground-based fueling facility or vehicle to the aircraft fuel tanks.

3. 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.
4. 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.
5. 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 14th 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>.