

# NOTICE

U.S. DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION

N 8900.660

National Policy

Effective Date:  
6/14/23

Cancellation Date:  
6/14/24

**SUBJ:** Jet Fuel Contaminated With Diesel Exhaust Fluid

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**1. Purpose of This Notice.** This notice provides information to aviation safety inspectors (ASI) on diesel exhaust fluid (DEF) contaminations of aircraft and outlines the procedures ASIs are to use after an incident has occurred. This notice also alerts and advises ASIs and foreign Civil Aviation Authorities (CAA) of events in which aircraft were refueled with jet fuel contaminated with DEF or were serviced with refueling equipment that was exposed to DEF.

**2. Audience.** The primary audience for this notice is Flight Standards (FS) Safety Assurance Offices' and International Field Offices' (IFO) ASIs with oversight responsibility of an aircraft operator's fueling procedures and fueling facilities, and ASIs assigned to the Aircraft Evaluation Division (AFS-100). The secondary audience includes the Airports and Aircraft Certification Service (AIR) lines of business (LOB), and the Office of Safety Standards and Foundational Business offices.

**3. Where You Can Find This Notice.** You can find this notice on the MyFAA employee website at [https://employees.faa.gov/tools\\_resources/orders\\_notices](https://employees.faa.gov/tools_resources/orders_notices) and the Dynamic Regulatory System (DRS) at <https://drs.faa.gov>. Operators and the public can find this notice on the Federal Aviation Administration's (FAA) website at [https://www.faa.gov/regulations\\_policies/orders\\_notices](https://www.faa.gov/regulations_policies/orders_notices) and DRS.

**4. Background.** There has been a growing safety concern in regards to aircraft fueling and contamination involving a substance known as DEF. There have been several cases of DEF contamination affecting multiple-turbine-engine aircraft. These incidents resulted in uncommanded in-flight engine shutdowns, emergency landings, and dead-stick landings. As of December 2019, there have been four cases of DEF contamination of multiple-turbine-engine aircraft. Three of these events occurred in the United States and one in Brazil. In all cases, the affected aircraft experienced in-flight operational malfunctions, as explained in detail below.

**a. Eppley Air Field Airport (OMA) in Omaha, NE, November 18–21, 2017.** During the period between November 18 and November 21, 2017, seven airplanes were fueled with jet fuel containing DEF at OMA. During the same time period, an additional six airplanes were fueled using refueling equipment that had been exposed to DEF. The DEF was inadvertently used (instead of fuel system icing inhibitor (FSII)) on two refueling trucks at OMA and injected into the fuel with each truck's FSII injection system. On December 26, 2017, the FAA published a Special Airworthiness Information Bulletin (SAIB) HQ-18-08R1, Engine Fuel and

Control – Operation with Contaminated Jet Fuel, to address the events of the DEF contamination at OMA.

**b. Miami-Opa Locka Executive Airport (OPF) in Miami, FL, August 12–16, 2018.**

Between August 12 and August 16, 2018, five aircraft were identified as having been fueled with jet fuel containing DEF at OPF. During the same time period, nine other aircraft were identified as having been fueled using refueling equipment that had been exposed to DEF. An investigation revealed that DEF was inadvertently used instead of FSII on a refueling truck at OPF, and was injected into the fuel with the truck’s FSII injection system. This affected both the aircraft receiving the contaminated fuel and the aircraft that were fueled with the refueling equipment that had been exposed to DEF. To address the events at OPF, the FAA issued SAIB HQ-18-28, Engine Fuel and Control – Operation with Contaminated Jet Fuel, dated September 13, 2018.

**c. Punta Gorda Airport (PGD) in Punta Gorda, FL, May 9, 2019.**

(1) Two Cessna Citation 550s were fueled with fuel contaminated with DEF. The first Cessna Citation 550 experienced an engine flameout at 35,000 feet, then experienced the second engine flameout at 8,000 feet on approach to Savannah Hilton Head International Airport (SAV). The flightcrew landed at SAV with both engines inoperative. There were no other damages or injuries. The second Cessna Citation 550 experienced an engine flameout at 36,000 feet and landed with one engine inoperative at Louisville International Airport (SDF). There were no other damages or injuries.

(2) The Fixed-Base Operator (FBO) at PGD fueled a total of seven aircraft, which is the only day the FBO used the refueling vehicle with DEF-contaminated fuel. Of the seven aircraft, only three were fueled from the vehicle’s “front” meter, which is where the FSII injection line is located. To address the event, the FAA issued SAIB AIR-21-08, Engine Fuel and Control – Operation with Contaminated Jet Fuel, dated April 20, 2021.

**d. Brasilia International Airport (BSB), Brasilia, Brazil, October 9, 2014.** Four aircraft had DEF injected; one of those aircraft returned to the airport due to having dual engine filter impending bypass warnings.

## **5. Discussion.**

**a. Similarities Between the Contamination Events.** All of these incidents of DEF being introduced into aircraft fuel systems were not isolated events. In each of the events, DEF was confused with FSII. The FBO inadvertently put DEF into the FSII mixing tank on the refueler trucks. All of the aircraft identified had documented cases of clogged fuel filters and fuel nozzle deposits with identified DEF-contaminated in the fuel tank that led to service difficulties and unplanned diversions.

**b. DEF.** DEF is a clear fluid that looks similar to FSII. It has caused multiple aircraft to make emergency landings due to either an inoperative engine, reduced power, or (in the Punta Gorda, FL, incident) having dual-engine shutdown that caused a dead-stick landing.

**c. FSII.** In each of the three events in the United States as discussed above, DEF was confused with FSII, which is more commonly known by brand names “Prist®” and “Dice®,”

and is also referred to as DiEGME. FSII is used to address the potential for water within jet fuel to freeze when the aircraft is at altitude. Its properties also make it ideal for the prevention of microbial growth that can occur in aircraft fuel tanks.

**d. DEF Storage.** DEF is not a fuel additive and should never come into contact with diesel or any other fuel. It should be stored in a separate tank, which on vehicles is typically identified by a blue filler cap, as seen in Appendix A, Examples of a Blue Filler Cap Identifying DEF.

**e. Procedures to Avoid Contamination.** The FAA has been working with an industry Aircraft Diesel Exhaust Fluid Contamination Working Group, hosted by the National Business Aviation Association (NBAA) along with an FAA Safety Risk Management (SRM) Team, to develop procedures to improve labeling and container identification and process control. Additionally, AIR, AFS-100, and other FS personnel wanted a method for Flight Standard District Offices (FSDO) and Certificate Management Offices (CMO) to evaluate operators on their process of controlling DEF or other potential fuel contaminants.

**f. Effects of DEF.** DEF is a urea-based chemical and is not approved for use in any aviation application. When mixed with jet fuel, DEF will chemically react with the jet fuel to form crystalline deposits in the fuel system. These deposits will flow through the aircraft fuel system and may accumulate on filters, fuel metering components, other fuel system components, or engine fuel nozzles. The deposits may also settle in the aircraft fuel tanks or other areas of the aircraft fuel system, where they may dislodge over time and accumulate downstream in the fuel system. Aircraft identified as having received the contaminated fuel have experienced clogged fuel filters, fuel nozzle deposits, and fuel tank contamination that led to service difficulties and unplanned diversions. Other aircraft that were serviced with the contaminated refueling equipment were exposed to trace amounts of DEF from residual fuel in the refueling hoses and equipment. See Appendix B for examples of filter deposits.

**g. Inspection Techniques and Corrective Maintenance Actions.** DEF forms crystalline deposits that are not soluble in fuel, so they cannot be removed by flushing the aircraft fuel system with jet fuel. Although the deposits are soluble in water and other polar solvents, use of these chemicals may have adverse consequences on aircraft and engine fuel system materials. Operators should contact Original Equipment Manufacturers (OEM) to develop inspection techniques and corrective maintenance actions appropriate for each specific aircraft model type and its level of exposure.

**h. Discarding Contaminated Jet Fuel.** Jet fuel that has been contaminated with DEF no longer meets the aviation fuel operating limitations of aircraft certificated to operate on jet fuel, and therefore cannot be used on those aircraft. Operators should ensure appropriate processes are applied to discard contaminated jet fuel that has been removed from affected aircraft to ensure it is not used on aircraft.

**6. Policy and Guidance.** There have been several safety recommendations that FSDOs and CMOs placed. In addition, AFS-100 and the Aircraft Maintenance Division (AFS-300) submitted Safety Assurance System (SAS) Assistance, Feedback, or Enhancement (SAFE) requests that were accepted. The Safety Analysis and Promotion Division (AFS-900),

Certification and Evaluation Program Office (CEPO) researched the recommendations and has implemented the following:

a. Development of the new FAA Order 8900.1, Volume 6, Chapter 11, Section 30, Monitor Jet Fuel Contaminated With Diesel Exhaust Fluid, which provides ASIs with guidance on DEF contaminations of aircraft and outlines the procedures that ASIs are to use after an incident has occurred.

b. Updates to Order 8900.1, Volume 6, Chapter 11, Section 21, Monitor Air Carrier's or Operator's Refueling Procedures (Parts 121, 125, and 135), subparagraph 6-2672C, to include a DEF reference and a note, which reads:

**“Diesel Exhaust Fluid (DEF).** The crystallization of DEF in the aircraft's fuel supply can quickly cause engine operability issues and failure. Additional references to consider when conducting this inspection include:

- Volume 6, Chapter 11, Section 30;
- Safety Alert for Operators (SAFO) 18015, Jet Fuel Contaminated with Diesel Exhaust Fluid; and
- Special Airworthiness Information Bulletin (SAIB) AIR-21-08, Engine Fuel and Control – Operation with Contaminated Jet Fuel, dated April 20, 2021.”

c. Updates for the SAS Data Collection Tools (DCT), affecting Element Performance Data EP DCT 6.2.1 (AW) question IDs (QID) 18937 and 55441.

## 7. Additional References.

a. **SAIBs.** These SAIBs, along with others, can be downloaded or viewed online at <https://www.faa.gov/aircraft/safety/alerts/SAIB/>.

- SAIB HQ-18-08, as revised.
- SAIB HQ-18-28, as revised.
- SAIB AIR-21-08, as revised.

b. **FAA Advisory Circular (AC) 150/5230-4, Aircraft Fuel Storage, Handling, Training, and Dispensing on Airports.** This AC is available at [https://www.faa.gov/regulations\\_policies/advisory\\_circulars/index.cfm/go/document.information/documentID/1040345](https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.information/documentID/1040345).

c. **National Transportation Safety Board (NTSB) Safety Alert 079, Fuel Providers: Prevent DEF Jet Fuel Contamination, dated July 2019.** This NTSB Safety Alert is available at <https://www.nts.gov/Advocacy/safety-alerts/Documents/SA-079.pdf>.

d. **Aircraft Diesel Exhaust Fluid Contamination Working Group: A Collaborative Industry Report on the Hazard of Diesel Exhaust Fluid Contamination of Aircraft Fuel, dated June 11, 2019.** This report was generated by aviation industry representatives and the

FAA and was chaired by the NBAA. The paper covers many DEF-related subjects, including the following:

- DEF contamination safety analysis.
- DEF contamination mitigation strategies.
- Short- and long-term recommendations.
- Additional background, notices, and recommendations.

**Note:** This industry report is available at <https://nbaa.org/wp-content/uploads/aircraft-operations/safety/DEF/20190611-Aircraft-DEF-Contamination-Working-Group-Report.pdf>.

**e. Energy Institute Video for Fuel Operators, “Control of Fuel System Icing Inhibitor and Diesel Exhaust Fluid at Airports,” dated November 1, 2021.** This educational video is available at <https://www.youtube.com/watch?v=l8mRbA7DVcc>.

**f. Airports Letter.** A letter from the Office of Airport Safety and Standards (AAS) to airport sponsors regarding DEF, dated October 29, 2018. This letter is available at [https://www.nata.aero/assets/Site\\_18/files/GIA/Diesel-Exhaust-Fluid-DEF-guidance-letter-to-sponsors-10-29-18%20\(2\).pdf](https://www.nata.aero/assets/Site_18/files/GIA/Diesel-Exhaust-Fluid-DEF-guidance-letter-to-sponsors-10-29-18%20(2).pdf).

**g. FAA SRM Team Report.** The members of the Aircraft Diesel Exhaust Fluid Contamination Working Group participated in an FAA SRM assessment. The result of this meeting consisted of the Safety Risk Assessment Report, entitled “Safety Assessment for Jet Fuel Contamination with Diesel Exhaust Fluid (DEF),” dated August 30, 2019. This can be viewed at [https://www.nata.aero/assets/Site\\_18/files/DEF/2019-08-30\\_Safety\\_Risk\\_Assessment\\_Report\\_DEF-Final.pdf](https://www.nata.aero/assets/Site_18/files/DEF/2019-08-30_Safety_Risk_Assessment_Report_DEF-Final.pdf).

**8. Action.** In the event of a DEF incident or contamination, the ASI will take the following actions.

**a. Halt the Fueling Operation and Inform Operator/Owner.** If DEF is found to be injected, poured, or mixed into an aircraft fueling truck or aircraft, immediately halt the fueling operation and inform the operator/owner.

**b. Inform Fueler.** On discovering a fuel contamination event, immediately inform the fueler so they can advise other owners/operators of the contamination. In past cases, fueling vehicles fueled multiple aircraft with the contaminated fuel. However, the operators of those aircraft were not informed until review of the fueling records.

**c. Inform Operator About Discarding Fuel.** Inform the owner/operator that any suspected DEF-contaminated jet fuel must be discarded properly and must not be used on any other aircraft or vehicle.

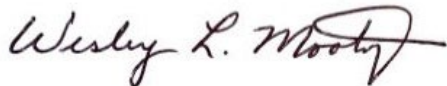
**d. Discuss With Local Fueling Providers.** Discuss with the local fueling providers how best to determine if any of their diesel-powered airport service vehicles require the use of DEF, and, if so, what procedures they have put in place to prevent and test for jet fuel contamination.

**e. Have Operator Contact OEMs.** Inform operators of aircraft that have been contaminated with DEF that they should contact the aircraft, engine, and auxiliary power unit (APU) OEMs to determine the appropriate inspections and maintenance actions to remove urea-based crystalline deposits from the fuel system. This action may include removing and replacing fuel system parts or components affected by exposure to these deposits.

**f. Inform Operator About Reference Documents.** Inform the operator about the reference documents within this notice (e.g., Order 8900.1, SAIBs, and SAFOs).

**g. Notify AFS-100.** As soon as possible after an ASI identifies a DEF contamination issue, they are to notify AFS-100 via email at 9-AVS-AFS-100@faa.gov (Attention: Propulsion Systems). AFS-100 will coordinate with the appropriate AIR technical specialist. The ASI is to provide their name, contact information, date, location, type(s) of aircraft affected, registration number(s) of affected aircraft, how the contamination was discovered, any fueler information, and any additional pertinent information.

**9. Disposition.** We will incorporate the information in this notice into Order 8900.1, Volume 6, Chapter 11, Sections 21 and 30 before this notice expires. Direct questions or comments concerning the information in this notice to AFS-100 at 9-AVS-AFS-100@faa.gov or AFS-300 at 9-AWA-AFS-300-Maintenance@faa.gov.



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**Appendix A. Examples of a Blue Filler Cap Identifying DEF**



**Appendix B. Examples of Filter Deposits**

