

FUEL CONTAMINATION - MAINTENANCE PRACTICES

1. General

- A. This section consists of information concerning fuel contamination. Included are definitions of various kinds of fuel contamination and the required actions when known fuel contamination exists.

2. Description

- A. Fuel is considered contaminated when it contains any foreign substances that are not provided under the fuel specification. These foreign substances normally consist of water, rust, sand, dust/dirt, microbial growth, unapproved additives and approved additives mixed at improper ratios to the fuel.
- B. All aviation fuels absorb moisture from the air and contain water in both suspended particle and liquid forms. Water contamination of the fuel is normally remedied by daily draining of water from the tanks utilizing the poppet drain valves.
- C. Particle contamination of fuels, consisting of sand, dirt and/or rust is usually caused by dirty refueling equipment, contaminated fuel storage equipment or damaged seals on fuel filler caps.
- D. All Model 20B/208B airplanes, even those utilizing an anti-ice additive and/or a biocide in the fuel, require periodic inspections listed in this section. Refer to Chapter 12, Fuel - Servicing, for the use of anti-ice, and biocidal additives for controlling ice and microorganisms of bacteria and fungi.
- E. When unapproved additives are blended with the airplane fuel, it should be considered contamination. Also anti-icing additive blended with the fuel at the improper ratio renders the fuel contaminated, unless the ratio of anti-icing additive to fuel mixture by volume can be corrected by the addition of nonpreblended fuel or additional anti-ice additive.

3. Removing Fuel Contamination from Airplane Fuel Tanks

- A. The procedures which follow define various types of fuel contamination and the specific action required to remove the contamination.

CAUTION: Observe all applicable local and facility safety regulations when performing fuel system maintenance. Refer to Fuel - Maintenance Practices.

(1) Water contamination.

- (a) There is no way to prevent accumulation of water formed through condensation in fuel tanks. The rate of accumulation due to condensation varies with temperature of the fuel, but samples of fuel should be taken daily at each poppet drain valve. Any water discovered by taking samples should be removed immediately.

NOTE: Water suspended in fuel appears in the form of droplets that reflect light. High concentration of water droplets will cause fuel to have a cloudy or hazy appearance.

- 1 Using an approved container positioned under poppet drain valve, open drain valve.
- 2 Allow fuel to drain until no more water is being expelled.
- 3 Close poppet drain valve.
- 4 Repeat procedure at remaining poppet drain valves until all have been serviced.

(2) Dirt, sand and rust particle contamination.

- (a) Dirt, sand or rust particle contamination is normally discovered when taking daily fuel samples from the poppet drain valves or evidenced by particles found in the fuel filters. If contamination is discovered, the contamination must be removed immediately as follows:

- 1 Completely defuel the airplane. Refer to Chapter 12, Fuel - Servicing.

NOTE: Fuel with known dirt, sand or rust particle contamination must be discarded as waste fuel.

- 2 Remove all access plates on bottom of each wing reservoir. Refer to Chapter 6, Access Plates and Panels Identification - Description and Operation. Also refer to Fuel - Maintenance Practices, Preparing Fuel Tank for Entry.
- 3 Using tack rags (commercially available from paint supply manufacturers), begin wiping interior areas of all fuel tanks. Tack rags should be changed frequently to prevent redepositing contamination back into the tanks. Continue wiping until no more contamination is present on tack rags.
- 4 Before reinstalling access panels on bottom of fuel tanks, inspect interior of tanks using a mirror and approved light to be sure all contamination has been removed.
- 5 Clean or replace fuel filters.

- 6 Reinstall access plates on wing reservoirs.
 - 7 Refuel airplane. Refer to Chapter 12, Fuel - Servicing.
- (3) Unapproved fuels contamination.
- (a) Any fuels introduced into the airplane fuel tanks that are not approved for usage should be considered contamination. Refer to FAA Approved Airplane Flight Manual for approved fuels.
 - (b) If unapproved fuels are added to the airplane fuel tanks, the airplane must be completely defueled. Refer to Chapter 12, Fuel - Servicing. After draining all residual fuel from the poppet drain valves, after defueling, the airplane may be refueled with an approved aviation fuel.
- (4) Improperly mixed anti-ice additive contamination.
- (a) When mixing anti-ice and biocidal additive, it must be mixed at a ratio as specified for the additive being used. Any mixture of additive in the fuel above or below the specified ratio must be considered fuel contamination.
 - (b) Should an improper mixture ratio of anti-ice and/or biocidal additive to the fuel by volume be discovered, the airplane should be completely defueled per Chapter 12, Fuel - Servicing, and refueled with properly blended fuel.
- NOTE:** As an alternative, the improper mixture may be corrected by the addition of the proper amount of non-preblended fuel or the addition of anti-ice and biocidal additive to bring the mixture ratio to within the specified concentration by volume. The reblended fuel/additive mixture must be retested to ensure the proper mixture has been obtained before returning the airplane to service.
- (5) Unapproved additives and foreign liquids contamination.
- (a) Should it be discovered that any unapproved additives or foreign liquids have been inadvertently introduced into the airplane fuel tanks, the airplane must be immediately completely defueled. All residual contaminated fuel must be removed by opening all poppet drain valves. Refer to Chapter 12, Fuel - Servicing.
 - (b) When all residual fuel has been drained, close all poppet drain valves and refuel the airplane with an approved aviation fuel. Refer to FAA Approved Airplane Flight Manual for approved fuels.
- NOTE:** All fuels contaminated with unapproved additives or foreign liquids must be discarded as waste fuel.
- (c) Before returning the airplane to service, the fuel filters must be cleaned or replaced.

4. Inspect Fuel System for Microbe Contamination

A. Microbiological Fuel Contamination

- (1) Hydrocarbon fuels, such as airplane turbine fuel, are subject to bacterial and fungal attack during storage, transportation and use. The microorganisms that feed on these hydrocarbons not only grow in small quantities of water present in fuel systems, but also grow in the hydrocarbon fuel itself. Microbes can live for months in essentially anhydrous fuels. Subsequent presence of water may produce rapid population increase.
- CAUTION:** Draining any water collected in the fuel sump areas on a daily basis is the most critical maintenance procedure to prevent water accumulation that may, if left unchecked, result in microorganisms contaminating the fuel system. This is especially important if the airplane is inactive for any period of time.
- (2) Microorganisms produce a slimy substance which suspends water and particulate matter in fuel. Suspended contaminants lead to fouled airplane fuel quantity probes, inaccurate gauge readings, and fuel filter plugging. Persistent or multiple fuel probe failures and/or presence of fouling in the fuel filters or sump drains may be indications of microbe contamination.
 - (3) Microorganisms also attack and perforate fuel tank sealants and coatings, permitting corrosive attack on the exposed metal. On unprotected areas, the microorganisms promote rusting of steel and corrosion of aluminum.
- CAUTION:** When initially using an anti-icing or biocidal additive, check the fuel filters at increased intervals. Dying microorganisms will release specks of dirt and corrosion by-products that have been entrapped in the fungal mats. Additionally, the fungus itself may be ejected from the walls and structures as it dies. Once dead, the slimy nature of the fungus will disappear, and should become more filterable.
- (4) Draining any water collected in the fuel sump areas on a daily basis helps prevent a water accumulation that may, if

left unchecked, result in microorganisms damaging the fuel system.

- (5) Treatment of the fuel system with biocidal additive every 30 days or as directed by the additive manufacturer is recommended to protect the fuel system from microbial attack. Refer to paragraph 4. (B) (below). If microbe contamination is persistent, an increased treatment schedule may be required. Depending on fuel and weather conditions, continuous treatment may be required to control contaminated fuel.

B. Inspect Airplanes Fueled Without Biocidal Additive

NOTE: Airplanes fueled without biocidal additive must be tested at one month intervals.

- (1) Drain a small amount of fuel from the fuel tank drains.
- (2) Test fuel with a suitable microbe testing kit. Refer to Chapter 12, Fuel - Servicing, Tools and Equipment for testing kit.

CAUTION: When initially using a biocidal or anti-icing additive, check the fuel filters at increased intervals. Dying microorganisms will release specks of dirt and corrosion by-products that have been entrapped in the fungal mats. Additionally, the fungus itself may be ejected from the walls and structures as it dies. Once dead, the slimy nature of the fungus will disappear, and should become more filterable.

- (3) If microbes have been found during test, treat fuel system with biocidal additive.

NOTE: Fuel must contain a concentration of biocidal additive as specified in the biocide manufacturer's instructions.

- (a) Biocidal additive concentration in fuel must be maintained for 10 consecutive days or per the manufacturer's instructions.
- (b) Retest fuel system for microbial contamination after the treatment.
- (c) Inspect and treat, if necessary, fuel system at one-month intervals or after every tenth fueling, whichever occurs first, after microbial contamination is eliminated.
- (d) If microbial contamination persists, clean tanks. Refer to Cleaning Fuel Tanks (below).
- (e) Maintain a concentration of biocidal additive as specified by biocide manufacturer if microbial contamination persists.

C. Inspect Airplanes Fueled With Biocidal Additive Blended with Fuel.

NOTE: This inspection should be performed at twelve-month intervals if airplane is continuously fueled with properly blended fuel containing biocidal additive.

- (1) Drain a small amount of fuel from the fuel tank drains.
- (2) Test fuel with a suitable microbe testing kit. Refer to Fuel - Servicing, Tools and Equipment, Tools and Equipment for testing kit.
- (3) If microbial contamination is detected, clean tanks. Refer to Cleaning Fuel Tanks (below), and inspect at more frequent intervals.

5. Cleaning Fuel Tanks

A. Fuel Tank Cleaning, Fungus and Corrosion Removal.

CAUTION: Extreme care should be exercised to ensure removal of all waste particles resulting from tank maintenance. Debris accumulation may block filters and ejector pumps.

- (1) Fuel tank may become corroded by fungus growth, present in hydrocarbon fuels, which becomes attached to lower surfaces of tanks. Fungus may be removed by hand scrubbing tank surfaces with a fiber brush and water.
- (2) While tanks are still wet, the presence of fungus is evident as a sludge or slimy material. When the tanks are dry, the presence of fungus is evident as solid deposits on the tank surfaces. These deposits may turn light brown when dry. If fungus is present, it is usually limited to the lower panel of the wing and areas immediately adjacent to the lower panel where water accumulates. In addition, fungus growth may contribute to corrosion of the structure. If corrosion to structure is observed, contact Customer Service, Telephone: 316-517-5800, Department 569 (Citation Marketing Division), Cessna Aircraft Company, P.O. Box 7706, Wichita, KS 67277, Email: TMDC@txtav.com.
- (3) Weep holes and drain tubes through wing stringers allow fuel and water to drain to the lowest areas of the wing tanks. These holes and tubes should remain open to prevent fuel and water accumulation when tanks are drained.