



The Danger of Water in Aircraft Fuel Systems

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Topics

Introduction

Main Sources of Water

Consequences

Corrective and Preventative Maintenance

Standard Methods to Detect Water

Introduction

- Water:
 - Ubiquitous part of our environment
 - Unavoidably infiltrates fuel systems
 - **Destructive** effects on fuel systems and **engine efficiency**
- Standard procedures are used to recognize the presence of water and removal

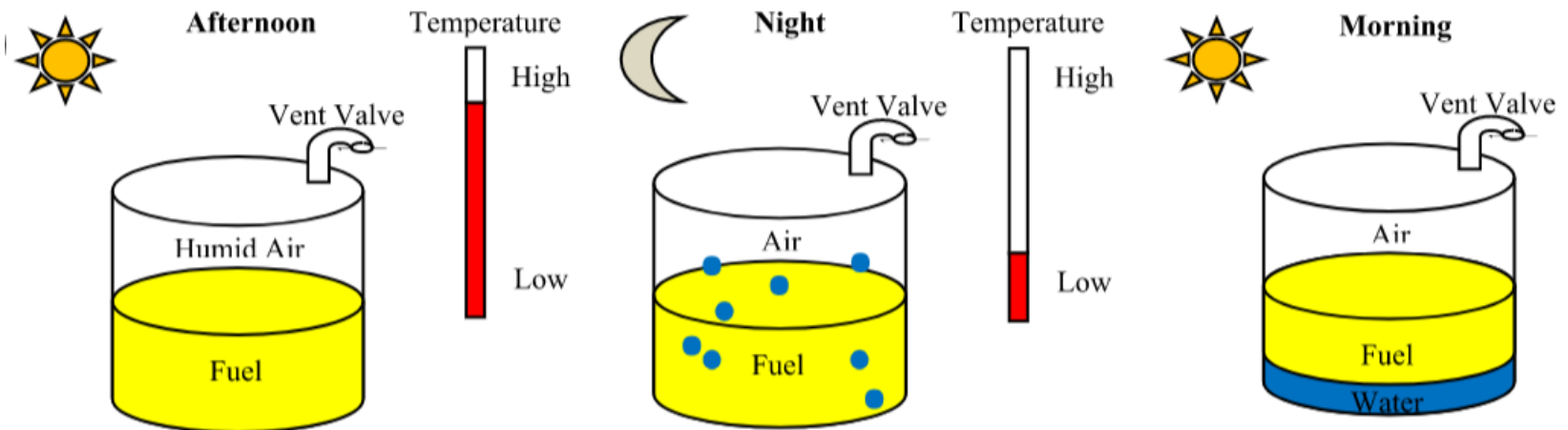
Main Sources of Water

- Rain
- incorrect maintenance of the fuel
- **Condensation from the air**

Main Sources of Water

Condensation from the Air

- Anywhere that has air, including fuel tanks, is in danger of a build up of water
- During the night, when the air cools, its water saturation point is lessened and so water precipitates out



Consequences

Microbiological Growth

- Water - optimal living environment
- Jet Fuel - carbon source (food)
- Microbiological growth:
 - Takes place in the **interface**
 - Form biomasses or biofilms that clog filters
 - Cause corrosion and changes in the fuel chemistry
 - Can give false readings in fuel gauges

Microbiological Growth



Consequences

Freezing Point

- Water freezing point: 0°C
- Jet Fuel freezing point: max -47°C
- Water present in the fuel will freeze at subzero temperatures Flights = clogged filters


Freezing Point



Consequences

Inefficient Burning

- Overexposure to water harm the filters ability to separate water from fuel, hence-water enters the engine
- Water changes the ideal fuel-oxygen ratio, which leads to inefficient burning, creating carbon deposits (soot)



Water in fuel systems is
unavoidable but
manageable

Corrective and Preventative Maintenance

Location of Valves

- Location is crucial for the effective removal of water
- during the design of fuel tanks, low points and other vulnerable areas must have drain valves

Corrective and Preventative Maintenance

Draining

- Water is denser than fuel
- When left to settle, water collects at the bottom, forming a layer that can be drained out
- Consistent water drainage is necessary in all types of fuel tanks (on the ground and in aircrafts)

Corrective and Preventative Maintenance

Anti Icing additive

- FSII – Fuel System Ice Inhibitor
- Dissolves in water
- Creates a lower freezing point solution (below 0°C) along with the free water and the water droplets
- Also used as a biostat

Standard Methods to Detect Water


Visual Test

- If water is present in drained fuel, an interface may be observed between the two
- Water may present itself as drops or cloudiness in the fuel

Standard Methods to Detect Water

Water Detector

- Under certain concentration the water cannot be seen in the naked eye
- Different indicators (pastes, stick, etc.) react with the water and change their color
- Humidity in fuel can be quantified by laboratory methods (Karl Fischer titration)



**Though dangerous,
water is a **manageable**
problem through **daily**
maintenance and **good**
housekeeping**



Questions?