

BioborJF® product line which was developed over 40 years ago by U.S. Borax and Standard Oil of Ohio. Hammonds (also a distributor for the commonly requested Prist® additive) is busting the myth about Prist® as Chartrand says there is some confusion as to what each of the additives does and what they do not do.

“Some people think they are using Prist® so they don’t need **BioborJF®**,” he says. “And some think by using **BioborJF®**, they don’t need to use Prist®.

But they do different things.

“Prist® is designed to act as an anti-icing agent for aviation jet fuels,” he says. “Scientifically known as a *fungistat*, Prist® changes the freeze point of water droplets.

“Prist®.....*won’t kill the bugs.*”

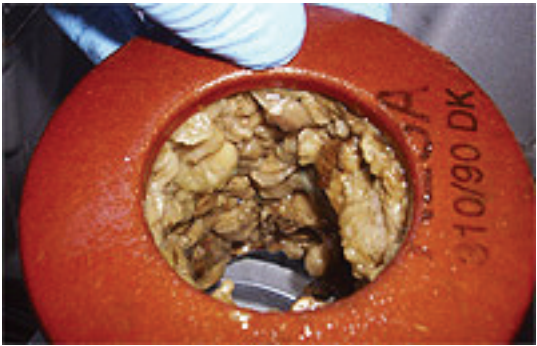
“It works like the candy coating on M&Ms—creating a shell and encapsulating water droplets that might contain the bugs,” he says. **Prist®** puts a barrier between any bugs and their water source but it *won’t kill the bugs*. It simply stops their continued growth.

“**BioborJF®**, on the other hand, is a *fungicide* designed as a pesticide for microbial growth,” he says. “It **attacks the bugs directly** by poisoning their food source, **eliminating** the problem of **clogged filters and lines** as well as the **corrosion** that comes from their acid waste by-products.”

Not all jet aircraft need Prist®, he says. Others “can’t fly” without it.

If an aircraft is equipped with a fuel heater, such as most airline aircraft, Prist® is not needed. But in the warmer surroundings of the heated fuel, HumBugs have a field day because they thrive in the warmer environment.

The service bulletin says that **BioborJF®** begins to act immediately but cautions the operator to allow sufficient time on large infestations for a thorough kill.



Build up of HumBug waste can harm vital engine parts

“The concern is that **BioborJF®** treated fuel in a contaminated tank will begin to break up large mats of growth into smaller ones which, once dislodged, could cause filter or line plugging,” the bulletin states. “It is important that treated fuel be allowed to kill an infestation completely.”

“Even still, when large, visual infestations exist, once killed, carcass remains and particulate matter which may have been trapped in large mats of microbial growth will need to be removed manually or by filtration.”

Chartrand says the dead bugs become brittle and lose their slimy characteristic. But the remains can still cause problems if the operator does not have a plan for dealing with them.

Once the treatment begins, however, what had been a serious maintenance headache now becomes a routine chore designed to keep the fleet in top operating condition and the life of the operator far less complicated.



The Worldwide Standard
Since 1965

Kills hydrocarbon utilizing “HumBugs” in jet fuel.

- ✓ Adds lubricity to fuel
- ✓ No clogged filters or corrosion of engine and airframe parts
- ✓ Less toxic, safer to handle
- ✓ Kills in water and fuel phase
- ✓ Military Spec MIL-S-53021A

Use recommended by major airlines and aircraft manufacturers.

A Product of



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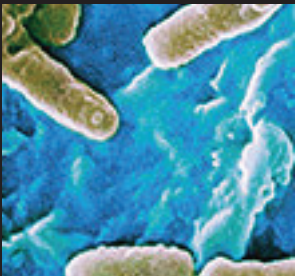
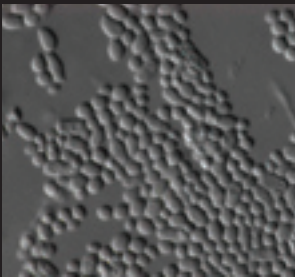
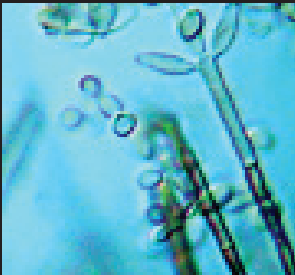
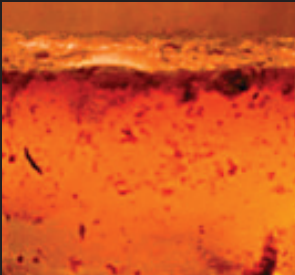
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Wing Tank
Corrosion
and Related
Fuel
Contamination

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Wing tank corrosion and related fuel contamination

by Jim Street

Even for the operator who practices good housekeeping, tiny creatures with scientific names like cladosporium resinae and Pseudomonas aeruginosa, but affectionately known as “**HumBugs**,” **can lurk in your jet fuel tank** and eat their way into **high maintenance bills for you** down the road.

Fortunately, there is a **simple test to find these hungry HumBugs**—or Hydrocarbon Utilizing Microorganisms—that can actually double in size in as little as 20 minutes and a product that can, as the Raid ads proclaim, “kill them dead.”

Walter Chartrand, Vice President of Hammonds Technical Services, Inc. and Hammonds Fuel Additives, Inc., both of Houston, says the product lines of his sister companies include a **test kit** to find HumBugs and their ilk and fuel-soluble biocide **BioborJF®**, which can **eliminate the HumBug colony** and keep it away.

It may stretch the imaginations of some to realize that there are creatures that not only can exist in the jet fuel tank of the company bird but that even thrive in tiny amounts of water and grow big and strong by actually eating the hydrocarbons and minerals in the fuel. “Most biological contamination consists of colonies of **bacteria** or fungus which **use the fuel as a food source**,” Chartrand says. “They reside at the fuel/water interface and, as they reproduce, they manufacture acidic by-products.”

He says there are dozens of strains of bacteria that thrive in the hydrocarbon environment and more than 250 varieties of which fewer than a dozen are actually our friends the HumBugs.

They require **four conditions to grow** and multiply: **fuel for a food source; water entrained in the fuel** or introduced by rain or condensation, **warmth** and **time**. The warmer the environment, particularly in excess of 72 degrees Fahrenheit, the faster the creatures multiply and the sooner your fuel tanks will be in trouble.

Jet airplanes are particularly **favorable habitats** for the **bugs to thrive** in, Chartrand says. Even the purest fuel has water in it—it’s part of the chemical makeup. The aircraft is filled with pure fuel and, at altitude, condensation forms, then turns to water when the aircraft lands.

“So you land someplace warm and humid like Fort Lauderdale and these microbes are jumping around in there having a great time,” he says.

But while jet airplanes are prime incubators for the HumBugs to develop, **they can occur in all components of the fuel handling system** including **storage tanks, pumps, filters** and **delivery lines** as well as the airplane’s **fuel tank**.

In fact, storage **tanks which** may **contain fuel for an extended period** are sometimes **more likely incubators** than an airplane which turns over fuel loads fairly quickly.

He says some fuel storage tanks were initially installed with the water sump drains at low point and fuel draw at a higher spot. But through improper installation or shifting and settling ground, the locations eventually become reversed. Therefore it is recommended that all jet fuel storage tanks have floating suction.



“An assortment of complications may be associated with microbial growth in addition to fuel degradation,” Chartrand says. “Existence of **HumBugs** in storage leads to **corrosion** and **pitting** which might result in actual **penetration of tank walls**. Fiberglass tanks are also affected by delamination by the microbes’ acidic waste by-products. Microbial **growth** in fuel quickly **clogs fuel filtering systems** which could result in equipment fuel starvation.

Pieces of eroded tank linings and **fungal debris** may pass through equipment fuel filters and **clog fuel lines** or **plug injector nozzles**, reducing efficiency,” he adds. “Fuel quantity probe damage is also common.

“In many installations, fuel quantity measuring devices incur damage and the slime interferes with the operation of such mechanisms leading to erratic or inaccurate readings,” Chartrand says. “**Sealant** and tank **top coatings** are **destroyed by the HumBug** waste products and sometimes serve as an alternative mineral food source.

”And finally,” he says, “fuel injector coking results in flow capacity loss and injector surface deposits.”

Chartrand says there are several ways an **operator can determine** if he is providing sustenance for HumBugs.

Slime deposits can show up on **tanks walls** or **pipng** that are **slick to the touch**. They might be greenish black or brown, but they can be almost any color, he says.

Other clues include black, brown or other **colored stringy material** suspended in **tank water** bottoms; **swelling of rubber surfaces** coming in contact with fuel; sludge slime deposits on filter surfaces, and a “**rotten egg**” **smell** of sulfuric acid.

“Some microorganisms produce hydrogen sulfide while breaking down the fuel resulting in a sulphur smell,” he explains. The resulting acid “tends to make holes.”

To be sure you have been visited by the HumBugs, Hammonds offers **simple and inexpensive HumBug Detector Kit®**. It consists of a septum bottle containing a sterile hydrocarbon fuel/water mixture.

A sample of fuel, oil or water bottom is injected into the septum bottle and if the material being tested is pure, nothing happens. But is **problems lurk**, the **mixture turns red**, telling one and all that the dreaded HumBugs are present.

The operator shows no water in the tank because the sensor is above the water but the pump is pumping out water,” he says.

Chartrand says the **BioborJF®** product can be used for **jet and diesel fuel**. But he says the **bugs** can grow strong and healthy in aviation applications and it **important to keep them controlled**.

That’s when **BioborJF®** come to the **rescue**.

BioborJF® is a special formulation of glycol borates designed for **maximum biocidal effectiveness** in hydrocarbon fuels and oils. It is authorized by FAA and **recommended by a host of airframe and engine OEMs**. It is registered with the EPA as a pesticide and **recognized by military** specification number MIL-S 53021.

It is **compatible with** a wide variety of **fuel system parts** and top coatings, sealants and elastomeric materials and does not affect fuel performance.

“When fuel tanks are opened for maintenance, a visual examination should be made to determine the presence of slime on interior surfaces and particularly in sump areas where slime proliferates,” a company service bulletin advises. “Water, routinely drawn from sump areas, should also be inspected for slimy debris.”

After fully inspecting the affected areas and repairing any damage that may have occurred, **BioborJF®** can be added to the fuel at a rate of 270 parts per million for the initial shock treatment and 135 ppm as a maintenance dosage to keep the bugs away.

The higher level for “shock” treatment is approximately one gallon of **BioborJF®** for 5,000 gallons of turbine fuel. The lower maintenance level equates to about one gallon in 10,000 gallons of fuel.

Chartrand emphasizes the need to provide a uniform level of treatment and **metered injection is strongly recommended**. Once again, Hammonds is ready and willing with a metering system.

In fact, it was the metering system that got Hammonds President and founder, Carl Hammonds involved in the aviation industry to begin with.

He says he was building metering equipment for various applications when he learned of a serious fuel tank corrosion problem in the early Douglas DC9s coming off the assembly lines. He developed an injector for adding treatments to fuel flows going into the then-new airplanes and the rest, as they say, is history.

The **Hammonds injector** can be **mounted on a fuel truck or fuel stand** to measure a **steady flow** of the additive in **exactly the right proportion**. They can also be free-standing on a small cart for mobility.

The additive injectors are driven by the fuel flow and **do not require external power** or other complicated installation. A simple mechanical pipe connection is all that is required.

“The efficient Hammonds fluid-powered motor **borrows** just enough **energy from the flowing product** line to do the job,” Hammonds brochure states. “**No need for electricity, air or pressurized additive lines**.”

The **fuel flowing** through the injector **powers pumps** that are calibrated by the operator.

“Complete, **passive operation** means they automatically operate when the rest of the system operates,” the brochure states. “If it is connected to the system, it ‘**remembers**’ **when to run, how much to inject** and **when to stop**. The operator has nothing to remember, nothing to adjust, nothing to forget.”

Many injectors are connected both to **BioborJF®** and Prist® lines and can be set to deliver either or both—or any other additives—to a fuel load.

Chartrand stresses the importance of a uniform flow of the product to the fuel system. He says one **BioborJF®** user poured the solution into his wing tanks instead of injecting it and it failed to kill all the microbes in all the tanks.

“He thought the product wasn’t doing its job,” Chartrand says. But it turned out that the problems had developed in a center tank and a



Fuel contaminated with fungal growth. This infestation can occur in aircraft fuel tanks causing clogged filters and corrosion.

dorsal tank—both some distance from the wing tanks—and the additive was just not getting everywhere it needed to be.

And he says, if the mixture is not evenly distributed, there is a danger of excessive concentrations. More than 1,000 ppm may cause the formation of solids, diminishing the product’s effectiveness.

If metered injection is not available, Hammonds recommends that the operator should fill the tank half-full with fuel, then add the **BioborJF®** to the fuel and complete the filling process to ensure proper dispersion. **BioborJF®** should never be added to an empty tank.

The company service bulletin recommends a two-step prevention program including the addition of **BioborJF®** and proper maintenance of the fuel handling system.

“This is a key step because the effectiveness of even the most efficient fungicide can be reduced if the fuel is allowed to retain fungal debris and high excesses of water,” the bulletin states. “Proper maintenance, therefore, requires regular removal of accumulated water bottoms and drainage of sump areas in addition to property filtering to remove debris.

“Filters and screens should be inspected regularly,” the bulletin advises. “Storage tanks must be included in regular cleaning and inspection schedules.

“In some instances, good housekeeping may be all that is needed to prevent fungal growth,” it concludes. “However, **contamination occurs very easily** and even the best maintained systems may need the assurance of **BioborJF®**.

“At **two cents a gallon**, it’s pretty **cheap insurance** says Jim McCrosky, director of maintenance for Exxon’s Houston-based Aviation Services. His fleet of four Hawker 800s were acquired eight years ago and **BioborJF®** is added with every tankful.

”We have never had any major damage,” he says. “Hawker says if you don’t use an additive you have to inspect the tanks every three months.”

He says Exxon’s corporate fleet inspects its Hawkers every two years and “we have had some minor cleanup, but never anything major. **We put it in and it works**. There is not much to say.”

McCrosky says some operators that do not use **BioborJF®** “probably wish they had.”

The Hammonds companies have acquired all rights to the