***Microbial Mine Detection System***

**Identifying Dangerous Materials Buried Under the Ground**

**Bacteria Shine as Base Seeks Hidden Bombs**  
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EDWARDS AFB - At a base with a history of high-technological feats, it's some tiny bacteria that will make headlines in October. These bacteria are special. They light up when they detect bombs or explosives, which will help the military eliminate some of the guesswork involved in identifying dangerous materials buried under the ground.

These microbes fluoresce when they feed on the vapors emitted from the leakage of explosives or bombs.

At the end of October, Edwards will play host to these bacteria as part of the ongoing testing of the Microbial Mine Detection System by Oak Ridge National Laboratories of Tennessee, creator of the system.

The technology could be used worldwide to eradicate a problem that was close to the heart of Princess Diana, who died three years ago Thursday - land mines.

But at Edwards, there are no land mines. There are, however, unexploded ordnances (bombs) that lie under bombing ranges at the base. If the bacteria can survive the extreme heat and aridity of the Antelope Valley, it could be used long term to help the base clean up its unexploded bombs, said Gary Hatch, chief of environmental public affairs at Edwards.

"We don't have mines on the base here, but the base has been used for years, particularly in the World War II era, for bombing ranges," Hatch said. "We still have ranges we use, although what we use now are just spotting charges."

Hatch said the base is developing procedures for cleaning up the (bombing) ranges, "so we are trying to build our inventory of technologies to use to help us economically locate where we might have to clean up past explosives."

The base will pay $200,000 to test the Microbial Mine Detection System.

The only hurdle now is getting U.S. Environmental Protection Agency approval for the testing, Hatch said. Edwards has submitted an application to the EPA to use the microbes, but Hatch said that's "just a formality" since the EPA approved the use of the microbes in South Carolina when testing was done there.

The Microbial Mine Detection System was developed by Dr. Robert Burlage, a staff scientist in the environmental science division at Oak Ridge National Laboratories in Oak Ridge, Tenn.

"The technology was developed in support of the Army to detect land mines," said Hatch. "There's a worldwide problem with land mines, and they need a cost-effective way to locate the things."

It's based on the principle that all bombs and explosive devices leak some of their contents as vapors. The microbes are applied to the top of the soil, so they can be seen. If they detect vapors, they light up. This illumination can be seen through lasers aimed at the microbes.

Hatch said the bacteria, called Pseudomonas Putida, is so common that "if you take a shovel full of dirt virtually anywhere in the world, you'll find this kind of bacteria." Scientists modified the microbes using a gene from a jelly fish that fluoresces, Hatch explained.

"This bacteria likes to eat TNT," Hatch said. "Dr. Burlage has said that whatever kind of substance you're talking about, there's probably a microbe that exists that uses it in some part of its life processes."

So far, the system has been tested extensively at Oak Ridge National Laboratory and at a site in South Carolina.

"They constructed an artificial mine field in South Carolina so they knew where the explosives were, and then they covered the ground with the microbes," Hatch said. "There was a good correlation between fluorescence intensity and where the mines were located."

Edwards offers a much harsher environment in which to test the microbes, Hatch said. These microbes happen to be sensitive to heat. They also need moisture. Considering how hot and dry the Antelope Valley is, "If they work here, they'll probably work anywhere," Hatch said.

Starting in late October, after the annual air show, the base will test the bacteria in three sites. One will be the air show strafing demonstration area.

Hatch said the base does simulated bomb runs during its air show in October. Airplanes fly by and open the bomb doors while TNT charges are set off on the ground.

"We're going to test that area because it's a known area. We know where the TNT is. We have an idea what the pattern should look like," Hatch said.

The second testing site will be at the junction of Jones Road and Lancaster Boulevard, where they suspect they'll find unexploded ordnances.

The third site will be the notorious Site 426 - trenches that lie near an airmen's dormitory. Although geophysics technology has not revealed any shapes that look like bombs, the Air Force is trying to avoid surprises by testing in the trenches, Hatch said. The geophysics used so far include two kinds of earth-penetrating radar that detect big metal objects and glass and plastics. Officials also used microwave technology.

"None of those has shown any of the characteristic bomb shapes," Hatch said. But, "We have this technology available. It's not going to be much additional cost to test that area."

All three sites will be tested in October. The microbes' activity will be measured over three or four hours to give them time to locate explosives. Officials think the bacteria may survive up to two or three days.

If this works, it could save the base money.

"We could have 100 square miles we need to check for unexploded ordnance," Hatch said. "The way we would probably use this here is we would first of all locate everywhere we think ranges were, and then we'd use geophysics to find any buried shapes, and if we see those, then we'd use this."

Hatch said this could be a costeffective way for officials to investigate such a large area.

"It could be very cost effective," Hatch said. "If we can determine that this works in this environment, it'll be a very effective screening process. Then we can detect where explosives are and where they're not, and we can immediately focus on the areas where they are, rather then testing vast areas, and maybe missing some."