

world

U.S. monitors underground Russian nuclear blasts in oil-rich Siberian field

WASHINGTON — The Soviet Union apparently exploded an underground nuclear device last October in an experiment aimed at unlocking millions of barrels of oil from a giant Siberian oil field, government geologists say.

James W. Clarke of the U.S. Geological Survey said such an experiment would mean the Soviets are attempting to use nuclear technology to turn the Salym oil field in the oil-rich Middle Ob region of western Siberia into one of the world's largest petroleum pro-

ducers.

Clarke and Jach Rachlin said in the USGS report Monday that they are confident a tremor monitored Oct. 4 was caused by an underground nuclear explosion. They said an extensive network of seismic stations located the blast in the oil field.

Estimates of oil reserves in the Salym region are as high as 10 billion barrels, making it the second most important oil field in Russia and one of the 10 largest known in the world.

But despite its great potential, Clarke said in an interview, the Soviets have managed to produce

only about 10 million barrels of oil there because it is in unusually tight bituminous shales — laminated rock that started out as mud and clay and was compacted and hardened over the ages.

The United States tried underground nuclear explosions in 1967 and 1969 in Colorado to release natural gas, but Clarke said instead of releasing the gas, the detonation sealed the gas reservoirs.

Oil reservoirs usually are in sandstone and can flow freely through spaces between sand grains. In shales, the oil moves through cracks

and Clarke said in tight shales, the cracks close as soon as the oil is pumped out, thus sealing off the rest of the oil.

A nuclear detonation in this rock would create a rubble column hundreds of feet in diameter. This could open up a much larger area for drainage of oil into a well. Clarke said a large number of explosions would be needed to extract oil from the whole field.

He said the Soviets have reported in scientific literature in the past that they used underground nuclear explosions to try to dislodge oil in

limestone. But he said there has been no mention from the Soviets of a recent experiment.

He said American geologists are interested in learning the outcome of the apparent Soviet experiment.

"We are reporting because it is such an unusual geological situation and it has such a huge potential, and it is a technique which perhaps should be reconsidered a little more," Clarke said.

The blast is believed to have equaled the explosion of several tens of kilotons of TNT. It had a magnitude of 5.4 on the Richter scale.

Tito 'gradually recovering' following amputation of leg

BELGRADE, Yugoslavia — An official medical bulletin said Tuesday President Josip Broz Tito is "gradually recovering" from the amputation of his left leg to halt the spread of gangrene that had threatened the 57-year-old leader's life.

"The general health condition of President Tito on the second post-operative day is good. Following the surgical intervention, President Tito is gradually recovering," the bulletin signed by Tito's doctors said.

Privately, officials said they are pleased with Tito's progress, but they also have noted the psychological as well as physical shock the president has suffered.

"The president feels good," an official said. "He's making further progress although it's still dangerous just two days after the operation."

Western diplomats carefully

noted there were two bulletins on Monday, apparently to reassure the country's 22 million people about their leader.

He was recuperating in the clinical center in the northern city of Ljubljana where the surgery were performed.

Some Yugoslavs have emptied their foreign currency accounts just in case they are blocked if something were to happen to Tito, Yugoslav sources said.

Yugoslavia has a hard currency, the dinar, and permits its people to maintain bank accounts in other hard currencies such as the German mark, Swiss franc and dollar. Hard currencies are exchangeable outside the country of origin.

The sources said some Yugoslavs with such accounts have discussed taking their money out and holding it in cash at home.

A little more than the standard hoarding of such essentials as flour and sugar has been going on, but food shops were still well stocked and there were few signs of panic.

Tito, a man of iron will whose favorite sport is hunting bear, is the only leader the country has known since World War II. He has championed nonalignment and led his country down its path to socialism in the shadow of the Soviet Union.

While the military was officially announced to have been placed on "extra vigilance" — just short of full alert — signs of overt activity on the part of the armed forces were few and far between.

Some anti-aircraft cannon capable of hitting slow planes were positioned at Belgrade airport but there were few armed soldiers inside the airport terminal.

Scientists find pristine cloud

PASADENA, Calif. — Astronomers say for the first time they have found material known to be unchanged since the beginning of the universe about 10 billion years ago.

Scientists at Caltech and University College London said Sunday that diffuse clouds of hydrogen may be pristine material from the beginning of the universe because they produce only hydrogen absorption lines and not carbon lines.


Carbon would show the clouds had been polluted by material formed after the so-called "Big Bang" explosion of primeval gases that began the universe.

The diffuse clouds of hydrogen will enable scientists to understand the processes that occurred after the Big Bang and also will allow a kind of "cosmic weather report" of conditions in space between galaxies, Caltech said.

Other astronomers have noted the existence of the clouds, Caltech said, but it was thought the clouds were ejected from quasars rather than floating independently in space.

The scientists were able to perform the analyses by using a device developed with funds from the United Kingdom Research Council.

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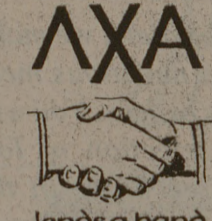
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