

NUCLEAR TECHNOLOGY

Dig With Nuclear Energy

Although digging a new Panama Canal with nuclear explosives may be practical, the question of radioactive fallout and Test Ban Treaty violation is raised—By Ann Ewing

See Front Cover

► THE USE of nuclear explosives to dig the proposed new "Panama Canal" raises serious questions both pro and con.

The biggest advantage is that excavating with nuclear blasts—to dig canals or cut through mountains—is a cheap and efficient method of moving earth.

However, there are drawbacks to such peaceful uses of atomic energy.

One is that digging a new "Panama Canal" by atomic blasts could be a violation of the Test Ban Treaty, which prohibits an explosion causing "radioactive debris to be present outside the territorial limits" of the testing country.

Another problem, potentially more serious, is the biological risk. One of the facts of life today is that all nuclear explosions create radioactivity.

Even when the atomic devices are detonated 120 to 150 feet underground, some radioactivity escapes into the atmosphere. If a nuclear explosion is buried deep enough to be completely contained, the resulting crater is too small to be of any use in earth moving.

Of the radioactive products, most are promptly distributed as fallout over an area downwind from the site. People living in the expected fallout area can be evacuated. However, the radioactive dust also falls on crops, and can thus enter the food chain.

This has happened in the case of iodine 131 produced by atomic tests in the U.S. Quite intense radiation exposures have occurred in communities whose milk supplies are local because iodine 131 entered the food chain.

Before any canals are dug or mountains cut through, therefore, an agreement would have to be reached concerning the Test Ban Treaty in which biological hazards would be at a minimum.

Seen on this week's front cover is a small scale model of one of the possible canal routes, the Sasardi-Morti route. In the photograph, several sections of the canal have been completed and one section is being fired about half way across, as indicated by the plume of the nuclear explosion. The vertical scale has been exaggerated over the horizontal scale by a factor of three.

The U.S. now has a substantial program underway to reduce the amount of fallout resulting from atomic blasts for excavating. Considerable progress has been made and even greater progress is promised for the future.

In the 1962 explosion called Sedan, part of Project Plowshare to investigate peaceful uses of nuclear energy, high levels of radioactivity from this underground blast of 100 kilotons reached about 60 miles downwind. Using today's improved techniques, this

spread would be only about 30 miles. Forecasts are that future progress should reduce the danger zone to five miles or less downwind.

The U.S. Atomic Energy Commission has recently announced charges for nuclear explosions—\$350,000 for a blast equivalent to 10,000 tons (10 kilotons) of TNT, conventional explosive, and \$600,000 for one equivalent to two million tons of TNT.

As a basis for comparison, 10,000 tons (10 kilotons) of chemical explosives would cost about a million dollars, and two million tons or two megatons about \$200 million. Thus, using nuclear explosives, the cost for large explosions is cheaper for the amount of energy released.

Although the cost advantage of nuclear excavation is clear, there are differing opinions concerning the risks. Risks are involved, Dr. Michael W. Friedlander, associate professor of physics at Washington University, St. Louis, has found in an extensive survey of Project Plowshare. The survey was made for the Greater St. Louis Citizens' Committee for Nuclear Information, which has consistently warned of the dangers of radioactive fallout.

In discussing the proposal for a new sea-level canal to replace the Panama Canal, which President Johnson has announced is a U.S. goal, Dr. Friedlander calls for a careful study of the living environment before a final decision to use nuclear explosives.

Although the effects of radiation on living things are being studied within this country, these findings may not apply to areas in which the pattern of life is very different, as it is in Central America.

Studies relating to Project Chariot, an experimental explosion once scheduled to dig a harbor in Alaska, showed that there were special problems of radiation effects on Alaskan animal life. Radioactive fallout concentrated in lichens, the food for caribou which are an important part of the Eskimos' diet. The project has since been shelved.

Before any nuclear excavation takes place, Dr. Friedlander urges the Atomic Energy Commission to show to "the satisfaction of the scientific community and the public" that the biological risk is acceptably small.

Study and open publication of the results of bio-environmental, geological, meteorological and engineering studies and their independent evaluation are necessary.

The total cost of excavating a sea-level canal with nuclear explosions is estimated to be between \$300 million and \$600 million. It would have a width of 1,000 feet and a depth of at least 60 feet. Cost of building another Panama Canal by conventional means would be nearly three billion dollars.

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Lawrence Radiation Laboratory

TO CUT A MOUNTAIN—This model represents a two-mile railway and highway pass through the Bristol Mountains in California that could be made using a series of nuclear explosions.

PUBLIC SAFETY

Scientific Speed Limits Would Make Roads Safer

► SCIENTIFIC SPEED LIMITS, established after a detailed study by qualified traffic engineers, would help make the nation's roads safer, a top researcher on traffic safety reported.

Reasonable, scientifically established speed limits will satisfy most drivers rather than frustrate them, as some of the present "horse-and-buggy" limits tend to do, said Dr. John E. Baerwald, professor of traffic engineering and director of the Highway Safety Center at the University of Illinois, Urbana.

Driving "too fast for conditions" has been found to be a major cause of accidents. Therefore, when establishing speed laws, such "conditions" as rain, snow, heavy traffic and vehicle fitness should be taken into consideration.

Dr. Baerwald believes that state and local lawmakers normally are not competent to create specific speed limits and therefore he makes three suggestions for increased highway safety:

1) Only qualified traffic engineers should be allowed to establish speed limits after a thorough study of a given situation and condition.

2) Broad area speed limits for different types of conditions should be created by the state legislature with the authority to revise the limits delegated to competent jurisdictions if and when warranted.

3) Local authorities and state highway commissions should be given the power to institute, on the basis of traffic engineering investigation, not only maximum but also minimum speed limits.

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