

# Hopes dim for a second canal

**Nuclear technology gap  
rules out a sea-level  
canal for the near future**

Ever since it was built, the Panama Canal has been both a commercial boon to shipping and a critical point in the defense concept of the United States. As the cold war deepened, worries about the vulnerability of the canal—with its locks and installations that could be easily damaged by local sabotage or military attack—led to discussion of the advisability of building a sea-level canal. Rioting in 1964 in the Canal Zone by Panamanians dissatisfied with the United States presence there gave impetus to the idea, especially since a sea-level canal could handle more traffic than a lock canal.

For five years the Atlantic-Pacific Interoceanic Canal Study Commission, set up after the 1964 riots, has been investigating the feasibility of digging a sea-level canal. One aspect that sustained the enthusiasm was the possibility of using nuclear explosives to blast through the Isthmus.

But nuclear explosives are not ready to do the job. And without that economical means of blasting, early construction by conventional means of a sea-level canal appears unlikely. Even if the commission's recommendation, due in December, is to build a canal by conventional means, with the dollar as tight as it is, there is little chance of getting such a proposal through Congress.

**Because of inflation,** demands for more attention to domestic problems and a lack of urgency—the Panama Canal can support the present traffic growth rate at least until 1985—a cost-conscious Congress will not readily agree to spend the \$2 billion to \$3 billion needed to build the canal by conventional means.

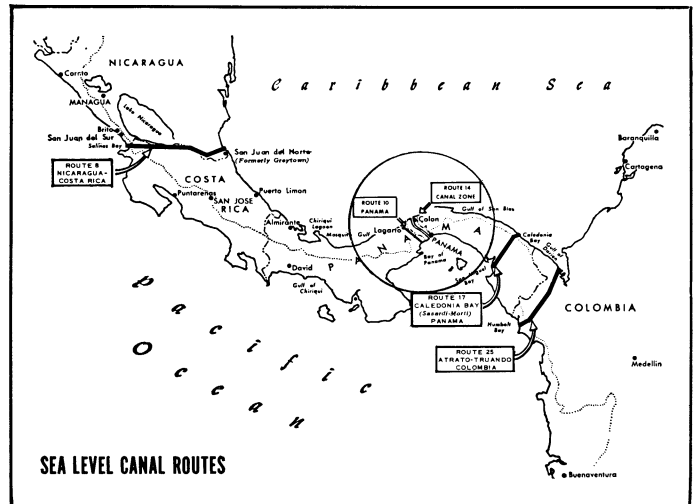
Commenting on the canal's chances, Rep. Leonor K. Sullivan (D-Mo.), chairman of the Subcommittee on the Panama Canal, says, "I think they're nil. I think it will just lie there."

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Corps of Engineers

*Chemical cratering (above) was to lead to nuclear excavation, but unfulfilled nuclear technology restricts canal routes to two (circled).*



Canal Commission

The one hope for bringing the canal's cost down—nuclear excavation—cannot be recommended by the commission, at least in the near future. The reason is simply an information gap; not enough nuclear excavation experiments have been done to determine if the method is technologically feasible.

"Nuclear testing has fallen so far behind schedule that we can't determine the feasibility or infeasibility," says John P. Sheffey, executive director of the commission. "The feasibility of nuclear excavation cannot be established for many years."

The reason for the information gap is that budget cuts have prevented the Atomic Energy Commission's Plowshare program (SN: 1/24, p. 89) from performing the necessary cratering experiments. In fact, next year there will be no funds available for nuclear cratering experiments (SN: 2/7, p. 148).

As a result, the important question of scaling up goes unanswered. For example, running down the length of the Central American Isthmus is the Continental Divide, composed of hard



Canal Commission

*Sheffey: Too far behind schedule.*

rock. Here nuclear excavation would be ideal, but the yield range required to blast through for a sea-level canal would be in the megaton range. To date, the maximum cratering experiment yield has been only 100 kilotons.

Another aspect of the problem is crater formation. To get the right size and shape, a number of charges must

be set in a row and detonated simultaneously to produce an elongated ditch. Again, only one row-cratering experiment—Buggy at the Nevada test site in 1968 (SN: 3/23/68, p. 280)—has been performed.

Compounding the lack of knowledge further is ignorance of the effects of nuclear excavation on an area whose geology is untested.

But possibly the biggest technological headache of all is radioactivity.

Here a technological problem spills over into the political arena. Despite efforts to produce a clean explosive using mostly thermonuclear components, nuclear scientists and engineers have been unable to produce zero fallout from cratering blasts. And the Limited Test Ban Treaty specifically prohibits detonations in which radioactive debris would be carried beyond the borders of the country in which the device is exploded. To get around the fallout problem, the United States would either have to get the 101 signatories to agree to a revision or appropriate interpretation, or else scrap it.

With nuclear excavation ruled out, two potential routes are also precluded for at least several years to come: Route 17, which is 100 miles southeast of the Canal Zone and 44 miles long, and Route 25, which is in Colombia and 107 miles long. That leaves Route 10, five miles west of the Canal Zone and 48 miles long and Route 14 in the Canal Zone itself, 47 miles long.

**Two problems** with Route 14 are that a canal through it would permanently knock out the present Panama Canal and possibly cause ecological harm. These effects would result from lowering the level of Gatun Lake, which constitutes 20 miles of the canal's waterway and provides water storage to operate the locks. In addition, because Route 14 is so close to the present canal, construction on it could induce slides there.

Both Routes 10 and 14 pose political problems, since Panama contends any new canal requires a treaty; this is unquestionably true for Route 10. Also the Panamanian Government has stated that it does not want a canal at present.

"The Government is not interested at the present time," says one Panamanian official, "because the attention of the economy would be diverted. The Government has been trying to diversify so the economy wouldn't be dependent on the canal."

Another possibility is not to build the second canal but to augment the present one with additional locks and channels. "We think it's a poor solution," comments Sheffey. "A new lane of locks would only increase capacity about 50 percent, and this capacity could be exceeded by demand in 15 to 20 years after it is built." □

## Ecology and the canal

If engineers are depressed about the gloomy future of a sea-level Isthmian canal, it presents a welcome breathing spell to marine biologists. Knowledge of ecological effects of such a canal is limited, and most discussion is still largely theoretical and often highly polarized. The delay will give scientists time for more studies—research that will be necessary in view of the near certainty that someday a canal will be built.

Scanty as the knowledge is, even the most sanguine researchers are convinced there is potential menace to both Pacific and Atlantic ecosystems. Most scientists, including members of a National Academy of Sciences committee appointed last summer to study the canal, believe a barrier, preferably of fresh water, should be built to prevent transfer of biota through any canal that is built.

**Two kinds** of speculation are going on. The first has to do with the possibility of great harm from migration of certain specific animals, such as the crown of thorns starfish and the *Pelamis platurus*, a brightly colored, sluggish and highly venomous sea snake (SN: 12/7/68, p. 578). Both creatures are now exclusively Pacific residents. The second, more general kind of speculation involves opposing theories about the way members of the whole spectrum of species from one side might interact with similar species on the other side.

Dr. Peter Glynn of the Smithsonian Institution's Tropical Research Institute at Balboa, Panama, reported this week that he had found a large infestation of coral-eating starfish on coral of Los Contrares Island west of the Gulf of Panama, the first fully verified report of the creatures in large numbers in the eastern Pacific. He is not certain whether the starfish are *Acanthaster planci*, the crown of thorns, or its eastern Pacific cousin, *Acanthaster elisi*, or even if there is any real difference.

The starfish have represented little menace in the eastern Pacific where there are few important coral formations. But Dr. William A. Newman of Scripps Institution of Oceanography says there is no telling what they might do if they get into the western Atlantic where there are 32 species of hermatypic—reef building—corals. There are 10 species in the western Pacific, where the crown of thorns has created havoc (SN: 3/28, p. 315).

"If the crown of thorns got into the Atlantic, there would be a very great risk of damage all the way from the Florida Keys to Rio de Janeiro," says

Dr. John C. Briggs of the University of South Florida.

Likewise with the *Pelamis platurus*, the paddle-tailed black and yellow sea snake. The snakes are not much of a menace on the Pacific side, where they usually stay well out to sea and where they are nearly immobile when beached by high winds. But no one knows what their habits would be in the Caribbean, and highly toxic as their venom is their very existence would be damaging to the tourist industry, says Dr. Howard L. Sanders of Woods Hole Oceanographic Institution.

Work by Dr. Ira Rubinoff, also of the Tropical Research Institute, indicates that large Pacific predators stay away from *Pelamis platurus*, but that Atlantic predators do not, at least under laboratory conditions. Thus the snake might initially be held in check in the Atlantic, but once predators acquired avoidance adaptations, then the snake might proliferate, says Dr. Sanders. But he concedes that there is no way to make surefire predictions about the sea snake or other creatures, including the bottom organisms he has recently been studying.

**These two** species represent just two specific threats. Robert W. Topp, a marine biologist with the Florida Department of Natural Resources, says there could be many more, including parasites that might be analogous to the sea lamprey which decimated unadapted Great Lakes fish when it was introduced through the Welland Canal in the 1930's, or a parasitic worm that seriously damaged sturgeon in Lake Aral in Russia when brought in by an alien sturgeon host.

There are also economically important species which could be affected in now unforeseen ways. These include the important shrimp fishery in Pacific coastal areas of the Gulf of Panama.

Topp and Dr. Briggs represent the two sides of an on-going controversy over more generalized theories of biological interaction. Dr. Briggs is convinced that there is greater diversity of life in Caribbean—where temperature, salinity and other physical conditions are more stable than in the Pacific—and species from that side would prevail competitively over similar species in the Pacific, thus rendering these extinct. He says incursion of species from the biologically diverse Red Sea into the less diverse Mediterranean through the Suez Canal provides a model.

Topp says that the analogy is invalid, since far greater differences exist between Red Sea and Mediterranean species than between the historically