

ous region, would come to about \$5 billion. This is not a large sum of money, considering that it would be spent over eight years. However, it is important that Colombia not go to the commercial banks to borrow the entire sum of money, and thus become a victim of the World Bank-International Monetary Fund.

There are ways to do this. One thing that you must do, particularly in light of the capability that Brazil and Argentina have in the region, is to push for the formation of an Ibero-American Common Market. This is quite feasible, because the entire region would benefit from the canal. Every nation's transportation costs would be reduced. That is enough of an incentive.

There is another method of financing which we suggested in Thailand, and it is favored by many government people. It does not involve any foreign exchange disbursement. Colombia should contact the interested governments and ask their help for building up the area and digging the canal. These construction companies would be paid in pesos, and once the canal is built, these countries would be allowed free passage, for the equivalent amount of foreign exchange. This is simple, and I am sure both the Japanese and the Brazilians would be more than happy to come in on this basis. A good part of the project can also be done by your own people. This is important, since it would train them in the process.

Then there is the question of PNEs. There are a great number of wild allegations about them. The problem is, that this technology has not been allowed to be used, under the pretext of concern about nuclear nonproliferation. Yet the results that the Lawrence Livermore and Oak Ridge scientists have obtained from their experiments indicate that the radiation would exceed the allowable level only within a 10-mile radius, for a month or so. This figure is not quite right, since these experiments were carried out in the '60s, and since then much better explosives have been developed—which nobody talks about. Let me tell you that the Russians have carried out more than 100 PNEs during the last 15 years, and I have not heard of any population decrease in the Soviet Union. A great deal of caution is always taken in using PNEs, and that should be continued.

But one should not get fixated upon PNEs. The canal is about 115 miles long, of which only 25 miles requires rock-blasting. The other 90 miles is silty clay saturated with moisture, an extremely easy soil to excavate. The canal can be built, because of the very high-quality excavators and earth-movers that we have developed over the years, even without using PNEs. The difference is money and time. The PNEs belong to an advanced-technology blasting process, which has a much higher productivity than that of conventional excavating equipment. The increased cost, if you do not use the PNEs, has to be borne by the Colombians, and that should be kept in mind before you hastily reject application of the PNEs (Figure 4).

How the sea-level canal can be built

by Maj. (ret.) Rafael Convers

Major Convers, a civil engineer and retired Army officer, gave the speech which we excerpt here at the Bogota forum on the Atrato-Truandó Interoceanic Canal.

After the Second World War, the United States noted how the traffic through the Panama Canal was growing and that this route would become inadequate in the near term. It therefore took transitional measures to increase the canal's capacity, by filling the locks in less time and increasing the total number of ship passages per 24-hour period.

The U.S. Congress, in turn, appointed a team and, with the approval of the countries concerned, designated technical commissions which researched the possible alternatives and concluded by recommending a new route through Panama, parallel to the present canal, as the most economical, and the Atrato-Truandó Canal as the newest advisable one in the second term.

Meanwhile, naval architecture broke the old molds and specifications; it launched into designing and constructing new warships and merchant ships, tankers, and transatlantic ships which can no longer cross either Suez or Panama, because they don't fit within the limitations of a lock canal.

Hence we are facing a situation in which world commercial traffic needs a new canal with much bigger specifications than the Panama lock canal, and Colombia has the opportunity to build it. Added to this is the advantage that Dr. Daniel Palacios Martínez, a Representative to the House from the province of Chocó, introduced a bill in 1983 that was passed in 1984 by the National Congress of Colombia, granting extraordinary powers to the Presidency of the Republic in order to promote the necessary studies and execute the canal project. That law, No. 53/84, was passed on Dec. 28, 1984. We trust that we are not going to end up with the law and without the canal.

It is necessary to create a mixed-economy agency attached to an administrative department under the Presidency of the Republic so that it can have sufficient autonomy and can manage the development of the canal project. This would be the juridical, administrative, financial, regulatory, and executive agency to capitalize the natural wealth of the province of Chocó and the wealth which will be generated during construction, which we are lagging behind in putting into

effect, and have lost six months, showing an incredible vacillation. The implementation of law 53 is, it seems, "bogged down."

One of the principal patriotic ends and purposes of this forum, is to awaken enthusiasm for the Atrato-Truandó Canal, showing its possibilities as the project that could save the country.

Technical considerations

If we accept that the first measure to be taken is to set up the juridical agency of the Canal enterprise, the second is to define the characteristics of the project, because the last project, which was executed in 1970, was for the construction of a sea-level canal, denominated Route No. 10, to the west of the Panama lock canal, which had a budget of \$2.88 billion (1970 U.S. dollars). In regard to our canal, the last study was that done by the late Dr. Tomás Castrillón, who was Minister of Public Works in April 1964, 21 years ago.

We have what we need to proceed to the final feasibility plan, without this keeping us from moving ahead with the great subdivision of 500,000 hectares, urban development, and the construction of the three super-ports, plus other projects foreseen for the financing of the construction of the canal. As we shall see, it is feasible to utilize the natural wealth of Chocó directly for the canal project.

We could even put up for public international bidding, the branch of the canal from the Gulf of Urabá to the mouth of the Truandó in the Atrato, where the regional transshipment center would be located, where the expressway will emerge to meet the highway from Medellín to the sea. This could be done while other aspects are being defined, related to cutting through the Baudo highlands—among other things, whether nuclear energy will be used, which would represent a 40% savings of costs and time.

The place where the canal opens into the Atlantic is currently in the process of being defined. Some have suggested that it lead to the mouth situated more to the north of the delta of the Atrato River; others that before running into the Gulf of Urabá it be joined to the León River, to shorten it, and that it come out on the southern side of the Gulf of Urabá; and a third more technical opinion, that raised by engineer Gustavo Castañeda Abbad, situates a superport at the Jeringa mouth, which has the advantage of not being affected by the trade winds, as happens with the mouths of the Tarón A, El Roto, El Coko and the eight others that look north. The same engineer says that the Atrato has a flow measuring 1,000 cubic meters of water per second, and in rainy season of 5,243 cubic meters per second.

Characteristics of a sea-level canal

In his book, *El canal a nivel*, (*The Sea-Level Canal*) engineer Demosthenes Vergara Stanziola gives interesting information on the factors to be taken into account in the

construction of a sea-level canal in Panama. We take from it the following data:

Trapezoidal form. Bottom width: 450 meters. Width at sea level: 600 meters. Depth: 85 feet (26 meters).

Costs: The sea-level canal along Route 10, according to 1970 reports, would be \$2.88 billion. I estimate that by 1985 the cost would be between \$11 and \$13 billion.

Among the port structures and infrastructure foreseen for each port are: cargo and passenger piers, conventional piers, roll-on-roll-off piers, petroleum piers for ships of 250 dead-weight tons, piers for minerals, mechanical piers, warehouses, coal piers, grain piers, piers for fertilizers, docks for toxic materials, and a six-way dock over the canal.

Just for the utilization of the canal, jobs would be created for about 24,000 persons.

The development of the Atrato Basin from the agro-industrial standpoint, plus the three superports and heavy industry, would require a large quantity of hydroelectric energy, which Chocó can produce in abundance.

The Hudson Institute of New York presented to the U.S. national government the preliminary project for the canal, the lakes, and the hydroelectric plants of the Atrato and San Juan rivers, the dam of the Atrato lake of 29 kilometers wide by 30 meters in height, which would require for its construction, materials whose cost would be beyond the country's debt-carrying capacity. But if the Atrato canal were built, the material of igneous rock could be taken from the cutting through the Baudo highlands, and the utopia of this hydroelectric plant could become a reality.

We must also mention that in 1982, the Japan International Cooperation Agency issued the master plan "Hydroelectric Project of the Atrato River." It contained a very complete pre-feasibility study of the six regularly spaced hydroelectric plants on the Atrato River, totaling a power capacity of 1,490 megawatts.

With this wealth of energy, the industrial and agricultural complex of the canal zone and the three superports will be developed, and there will be surplus energy to export to Central America. The construction of Atrato-Truandó Canal will give full employment to Colombians, bringing an end to violence. It will be the economic salvation of the country.

This possibility presumes that Law 53 of 1984 will be carried out. The nation cedes to the Atrato canal agency the natural riches that are found in the Chocó province, of which some are quantifiable and others not, but which can be captured insofar as they are offered up for sale to the public, with sufficient guarantees through an official trust entity, which could be the Bank of the Republic or some other entity which is backed by the Republic of Colombia, since Law 53/84 amply authorizes the nation to take the necessary measures to promote the studies and construction of the interoceanic sea-level canal: all with the due control and oversight of the Comptroller's Office.