

Hypo-Loop Container Freight Transport: PART II

Macro-Imageneering New World Macro-Projects

Richard B. Cathcart¹, *GEOGRAPHOS*, Burbank, California 91506, USA

Charles William Finkl

Department of Geosciences, *Florida Atlantic University*, Boca Raton, Florida 33431, USA

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Abstract: The proposed Hypo-Loop megaproject, which would tunnel under the Darién Gap, could provide a safe conduit for the transport of container freight and passengers between Panama and Colombia. The advantage of a tunnel linking Central America with South America is that transport would be via an underground low-pressure steel tube that alleviates terrestrial compromises of the environmentally sensitive Darién Gap ecosystem, which is recognized as an important natural environmental linkage between Panama and Colombia. This tunnel link is technically feasible using today's modern tunnel boring methods that are amenable to providing infrastructure for mixed modal train transport. The Darién Gap Hypo-Loop Macro-project has the potential to provide environmentally safe transport across sensitive ecosystems by tunneling beneath them and at the same time opening up expansive transfer of goods and materials in the New World. Initiation and completion of the Hypo-Loop under the Darién Gap landscape would bring this region into the 21st Century as a showcase for enhancing the quality of life and improving New World economic systems.

Key-words: Panama, Columbia, Atrato River, Hypo-Loop, passenger pods, containerized freight shipment, Darién Gap, Panama Canal, tunneling technology.

Resumo: O megaprojeto *Hypo-Loop* proposto, com tunelamento sob o *Darién Gap*, poderia fornecer um canal seguro para o transporte de contêineres e passageiros entre o Panamá e a Colômbia. A vantagem de um túnel que liga a América Central à América do Sul é que o transporte seria por meio de um tubo de aço subterrâneo de baixa pressão que evitaria o comprometimento do ecossistema *Darién Gap*, reconhecido como um importante vínculo ambiental natural entre o Panamá e a Colômbia. Esse túnel é tecnicamente viável pelos métodos modernos de perfuração, capazes de fornecer infraestrutura para um modal misto. O megaprojeto *Darién Gap Hypo-Loop* tem o potencial de fornecer transporte ambientalmente seguro através de ecossistemas sensíveis, encapsulando-o sob eles e, ao mesmo tempo, abrindo um amplo intercâmbio de bens e materiais no Novo Mundo. No cenário do *Darién Gap*, a realização do *Hypo-Loop* faria dessa região uma vitrine sobre a melhoria da qualidade de vida e dos sistemas econômicos do Novo Mundo no século XXI.

Palavras-chave: Panamá, Colômbia, Rio Atrato, *Hypo-Loop*, cápsulas de passageiros, remessa de carga em contêiner, *Darién Gap*, Canal do Panamá, tecnologia de tunelamento.

¹ Corresponding Author's E-Mail Address: rbcathcart@gmail.com



1. Introduction

The excavation and stabilization of the Culebra Cut insured the Panama Canal's subsequent success. Hypo-Loop tunneling under the Darién Gap, shared by Panama and Columbia, will insure the future containment of menacing contagious diseases affecting valuable livestock. During 2019, UNICEF reported that >24,000 persons, 16% of whom were children, crossed the dangerous mature rainforest that is the Darién Gap's landscape; the illegal migrants first find shelter at La Penita in Panama's Darién Province before continuing their journey northwards, usually passing through Panama to adjacent ecosystem-states. It is likely that the population of migrants will increase markedly due to unsettling conditions in many societies, especially Venezuela and Columbia. Meantime, on 29 March 2020, the Panama Canal Authority, in a humanitarian gesture during the COVID-19 pandemic, allowed the cruise-ship *Zaandam* to transit the artificial waterway to return to the mainland USA.

A macro-project plan to link all the capitals of the New World through railways was first outlined at the Pan-American Conference meeting in Washington, D.C. of 1899-1890. Later, the macro-imageneering plan to connect the New World by unified highways was first revealed at the Pan-American Conference at Santiago, Chile, during 1923. To increase its international competitiveness [1], the Panama Canal, which operates continuously, has been macro-engineered for modernization, increased its freshwater-lock supply and performance capacity for more and larger ship passages. Its encompassing watershed is being better protected to afford reliable dry-season freshwater river flows needed for the Canal's consistent latitudinal operations [2] but there is, as yet, little adaptation to accommodate the near-term future presence of autonomous vessels [3]! The absence of both a longitudinal railway and a highway system traversing the biologically crucial Darién Gap, a vital biodiversity conservation zone directly affecting the livelihoods of >100,000 indigenous people there, prevents legal land-based international trade and travel and also forestalls efficient patrolling for illegal rainforest logging and gold mining offenders.

Formed by Nature ~2.8 million years ago [4] the isthmus of Panama is subject to earthquakes potentially affecting future modernized Panama Canal operations [5]. Shared territorially by Panama and Columbia, the Darién Gap (Figure 1), remains a natural landscape — Panama's 579,000 ha Darién National Park, created in 1980, and Columbia's 72,000 ha National Park of Los Katios, created in 1974 — as well as a modern transportation interval, a ~100 km-long missing land link. Columbia currently has no railway connections with any other New World country and Panama has no railway connecting that nation's two international border landscapes. Standard International Shipping Containers on loaded trucks, and passenger-carrying automobiles, have to be ferried between these adjacent ecosystem-nations by task-dedicated ships.



Figure 1. The Darién Gap’s mature rainforest and swamps intervenes between Panama and Colombia.



Figure 2. Panama and Colombia electrical grids linked across Gulf of Darién by underwater power-cable.

2. The Darién Gap

The region's Hispanophones commonly refer to the Darién Gap as “el Tapon de Darién, “*tapon*”, meaning “seal”, “lid” or “stopper”; “*tapon*” is a statement recognizing the long-term need geopolitically for a permanent peaceful institutionalization of the existing Columbia-Panama boundary-line. A trans-Darién Gap Hypo-Loop installation could be made to function as a secure border control outpost for both ecosystem-states at their mutually-shared demarcated territorial separation [6]. But for objections from both nation's citizens, if in the past a strip of Darién Gap rainforest had been cleared for a railway and the Pan-American Highway, the whole of Darién Province would probably have been cleared, settled and farmed [7]. During 2019, a new macro-project attempting to complete a 20th Century governmental economic development goal — the electrical interconnection of Panama and Columbia — was again being considered: the latest plan foresees a 55 km-long submarine transmission cable installed in the Gulf of Darién to avoid intrusion into the Darién Gap landscape [8]. The ~614 km-long powerline is planned to connect the Panama II sub-station in Pedregal with the Cerromatoso sub-station in Columbia (Figure 2).

Contingencies enveloping a linear, direct origin-to-destination, Hypo-Loop design that has no interactions with other major transport modes or wildlife; thus, it need never produce for its innovators any truly significant environmental uncertainty: thorough geo-technical investigation could be performed to develop site-specific design criteria, selection of tunneling method. Entrance and exit shafts — the base stations in each ecosystem-country — shall not exceed one hectare in area. Hypo-Loop's developers are deliberate well-trained human technological engineers, not natural ecological engineers like dead cocaine kingpin Pablo Escobar's exotic 100 or more *Hippopotamus amphibius* which observing biologists now consider a Tropic Zone introduced re-wilding experiment [9]! The general Hypo-Loop macro-imagineering idea dates from 1909-1917 [10]. This singular Hypo-Loop concept for Central America anticipates “Standard International Shipping Containers + Passenger Pods” riding in a wheel-less train levitated on a layer of pressurized air or magnetic force-field cushions used regularly within a fixed-guideway sealed within an underground low-pressure steel tube [11]. Subterranean facilities cannot be compromised by windstorms and are barely affected by earthquake vibration! All cargoes would be routed according to RFID bar-codes based on freight origin and destination. No passenger should ever have occasion to have an unpleasant or frightful experience; in other words, earthquake motions that cause lateral deformations of the tube could cause centripetal forces within the comfortable passenger pods that must be preemptively compensated by careful Hypo-Loop designers [12]. Scheduled mixed-modal trains equipped with electronically augmented pod windows — actually, television screens — could present simultaneously the Darién Gap landscape being under-passed [13].

3. Columbia's most relevant pre-Hypo-Loop macro-project history

The lowest elevation of the New World's mountainous Continental Divide (~100 m) which is also geographically the narrowest (~2 km) separates two major rivers in Columbia, the south-flowing Atrato and the north-flowing San Juan [14]. Circa 1788, Antonio Carezo completed a dug border-defining boat channel which, for a short time, artificially linked the two watersheds; one hundred eighty-eight years later Colombian authorities announced a macro-imageneering conceptual plan for a Pacific Ocean-Atlantic Ocean Canal to compete with the extant Panama Canal [15] (Figure 3). Their plan never became a project.

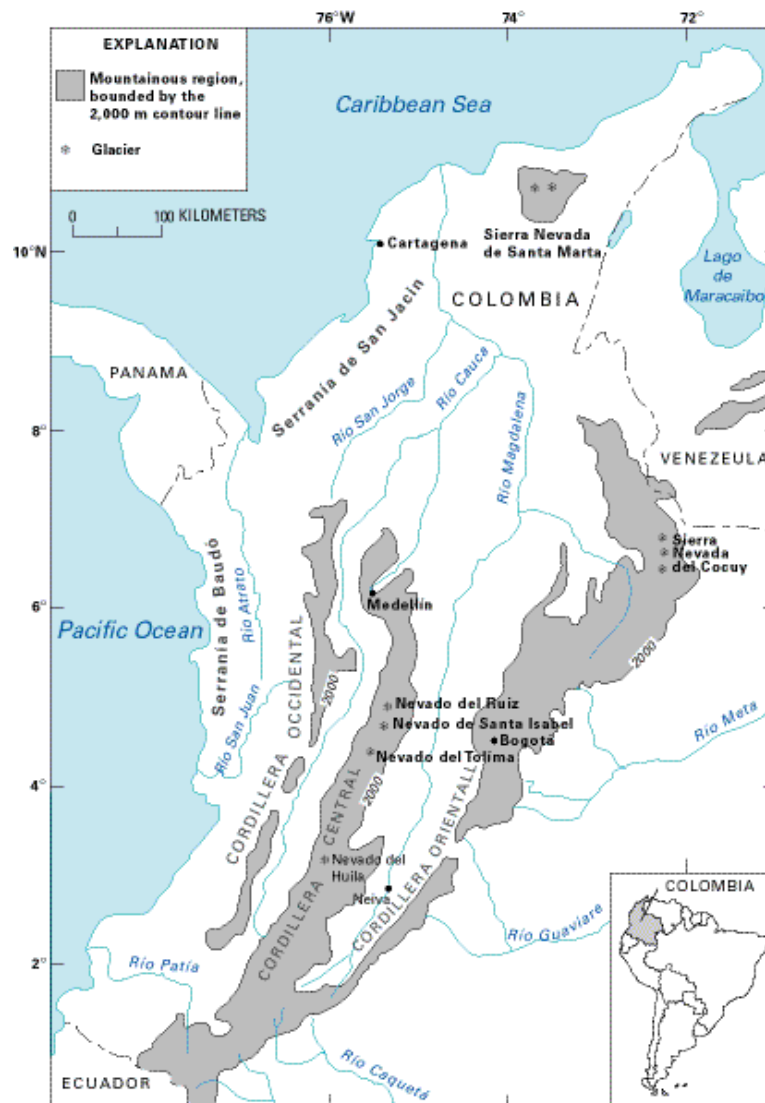


Figure 3. On the left-side of the map, paralleling Columbia's Pacific Ocean coastline, are illustrated the natural courses, anthropogenically linkable, of the San Juan and Atrato rivers.

4. Tunneling the Darién Gap

Installation of the Hypo-Loop under the Darién Gap landscape would seem to be a logical and appropriate outcome of the fiscally-conservative Initiative for the Integration of the Regional Infrastructure of South America [16]. Neither Elon Musk nor The Boring Company (in Hawthorne, California, USA) have provided technical specifications of the existing “Prufrock” TBM. Still, biological investigations indicate that burrowing underground is advantageous for many species of animals: indeed, “...the entire surface of our planet is built upon one big complex and constantly evolving burrow system, controlling the nature of our existence” [17]. Tunneling beneath the Dairén Gap will entail the confident handling of geotechnical information required for contractual reasons; a modest coping effort with the little-changed ground stress field during excavation; safety-tested steel pipeline installation; post-Hypo-Loop excavation design goals fulfilled satisfactorily; the intensive use of numerical super-computer modeling that is based on documented human experience. Rock formation mass conditions will, of necessity, influence cost factors most directly related to mechanical rock properties, discontinuities with the Darién Gap rock formation as well as the presence of groundwater. Year 2020 typical costs to remove one cubic meter of jointed, limestone dolomite and chalk using TBM equipment are about USD\$73; \$146 for weak marly rocks, weak sandstone above the water-table; \$438 for weak marly rocks, weak sandstone below the water-table or sand, silt and clay above the water-table and, lastly, about \$1,460 to remove sand, silt and clay that is below groundwater. As to The Boring Company’s “Prufrock” TBM, it may be based on crack propagation of burrows accomplished simply in Nature by worms such as *Nereis virens* [18]; human tunneling efforts have been labeled by geoscientists as a form of past and present-day bioturbation [19].

5. Conclusion

The proposed Darién Gap Hypo-Loop Macro-project must be classed as a true infra-structure meant to make everyday life for the citizens of Panama and Columbia and others elsewhere easier. There is the possibility that Hypo-Loop may be cheap to build and operate as well as convenient and reliable to use! It might become the Darién Gap’s largest technical system — that is, exceeding the Panama Canal in value — by delivering specialized services, materials, and assets to households, corporations and organizations, governmental and private-sector. Like marked and monitored for safe navigation natural channels and air-lanes, Hypo-Loop installations are always invisible. Construction requires socio-technical expertise and common-man confidence in the completed facility and its future increase in real-world value, stimulated peaceful geopolitical cooperation and strong boosting of future innovative thinking (Macro-Imagineering) [20]! Therefore, it is intuitive that the Darién Gap Hypo-Loop Macro-project ought to be considered at the outset as an all-services single sustainable utility corridor infrastructure connecting the entire New World [21].

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