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## **TRANSANDEAN RAILROADS: THE INTERRUPTION OF SERVICE AND PROSPECTS FOR RESUMPTIONS**

Building the infrastructure and then operating a railroad which starts on the Pacific coast of South America and which, a few score kilometres inland, must climb close to 4,000 metres above sea level in the Andes mountains has always presented challenges both for the civil engineers responsible for its construction and for the managers in charge of its operation.

As at mid-2001, two of the four transandean railroads that ran 20 years ago are out of service, owing to adverse weather conditions, and a third is not operating as a result of institutional problems.

Nevertheless, two of the three railroads that are now shut down could resume service soon. Furthermore, there is a possibility that a new transandean railroad could be built that would cross the Andes mountains further south, at an altitude of less than 1,750 meters.

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### **ONLY FOUR TRANSANDEAN RAILROADS IN THE TRUE SENSE OF THE WORD**

By definition, a transandean railroad should go up one side of the Andean mountains and come down the other. There have never been more than two railroads that truly fit this definition. These are the so called Transandean Railroad (Ferrocarril Transandino, FCT), between Mendoza in Argentina and Los Andes in Chile, and the railroad sometimes known as the Northern Transandean Line (Transandino del Norte, C14), which links Salta in Argentina and Antofagasta in Chile. In addition, the idea of building a Southern Transandean line between Zapala in Argentina and Lonquimay in Chile is still a possibility.

However, the two railroads that link Bolivia with Chile are also considered to be transandean railroads. These are: (i) the Antofagasta to Bolivia line (Ferrocarril Antofagasta a Bolivia, FCAB), and (ii) the Arica to La Paz line (Ferrocarril Arica a La Paz, FCALP). Of course, these both climb the mountain on the western side, but the descent on the other side is (or was) carried out by other lines connecting with Aiquile in Bolivia, or San Salvador de Jujuy and Salta in Argentina, via Uyuni and the border crossing in Villazón/La Quiaca.

These are the four railroads considered to be transandean for the purposes of this article. Not taken into account are the truly national ones in Ecuador, where one track goes up and then down the same side or those in Peru where there is no railroad with a continuous track that climbs from the coast and descends on the eastern side; nor in Colombia, where different lines cross the Andes, without being considered as a real network. Nor does the article refer to the trans-isthmus railroads in Costa Rica, Guatemala, Mexico and Panama.

### **STEEP GRADIENTS, HIGH COSTS AND LOW PROFITABILITY**

Usually, the maximum acceptable gradient for a non-tourist adhesion railroad is approximately 4%. It is possible to pull adhesion trains over steeper gradients, but the pulling power of the engines would be severely restricted. Since the Andean peaks are 80 to 150 km from the coast of the Pacific Ocean and the mountain passes in latitudes from Santiago to Lima are 3,200 to 4,500 metres above sea level; a railroad track laid in a straight line would have an average gradient of between 2.1% and 5.6%. Barring huge investments in engineering, the maximum gradient would have to be higher than that. Engineers were able to solve the problem of gradient when they lengthened the FCAB track, laid out the track in zigzag, or switchbacks (C14), or placed a tooth bar (FCALP and FCT). In any case, transportation costs were very high and, without taking into account the case of FCAB, the movement capacity was relatively low.

None of the transandean lines discussed in this article has transported more than 350,000 tons of cargo, bi-directionally in any given year. In the FCT, on the steeper, Chilean side, the maximum haulage capacity even among the most modern electric locomotives has been 150 gross tons, and one of FCALP locomotives is authorized to transport only 130 tons. Under these circumstances, the kilometre-ton costs are extremely high owing to the wear and tear on the equipment and because no economies of scale are involved. In Chile, in the early 1990s, before the privatisation of cargo rail transportation, the fees charged by the FCLP fluctuated between 250% and 300% above those charged by the rail lines of the central and southern zones of the country where the terrain is flatter. After privatisation, no further data on this issue was disclosed.

Of all the transandean railroads, only the FCAB has had a commercially acceptable profitability.

### **DEACTIVATION OF TRANSANDEAN RAILROADS**

The first transandean railroad deactivated was the FCT, following a series of landslides on the track on the Chilean side in the winter of 1984. The Chilean Government did not see any sense in investing funds for the repair of the damage since it would inevitably have lost more money in the operation of the trains later on. In any case, the railroad mode was moving less than 10% of international cargo transportation through that corridor.

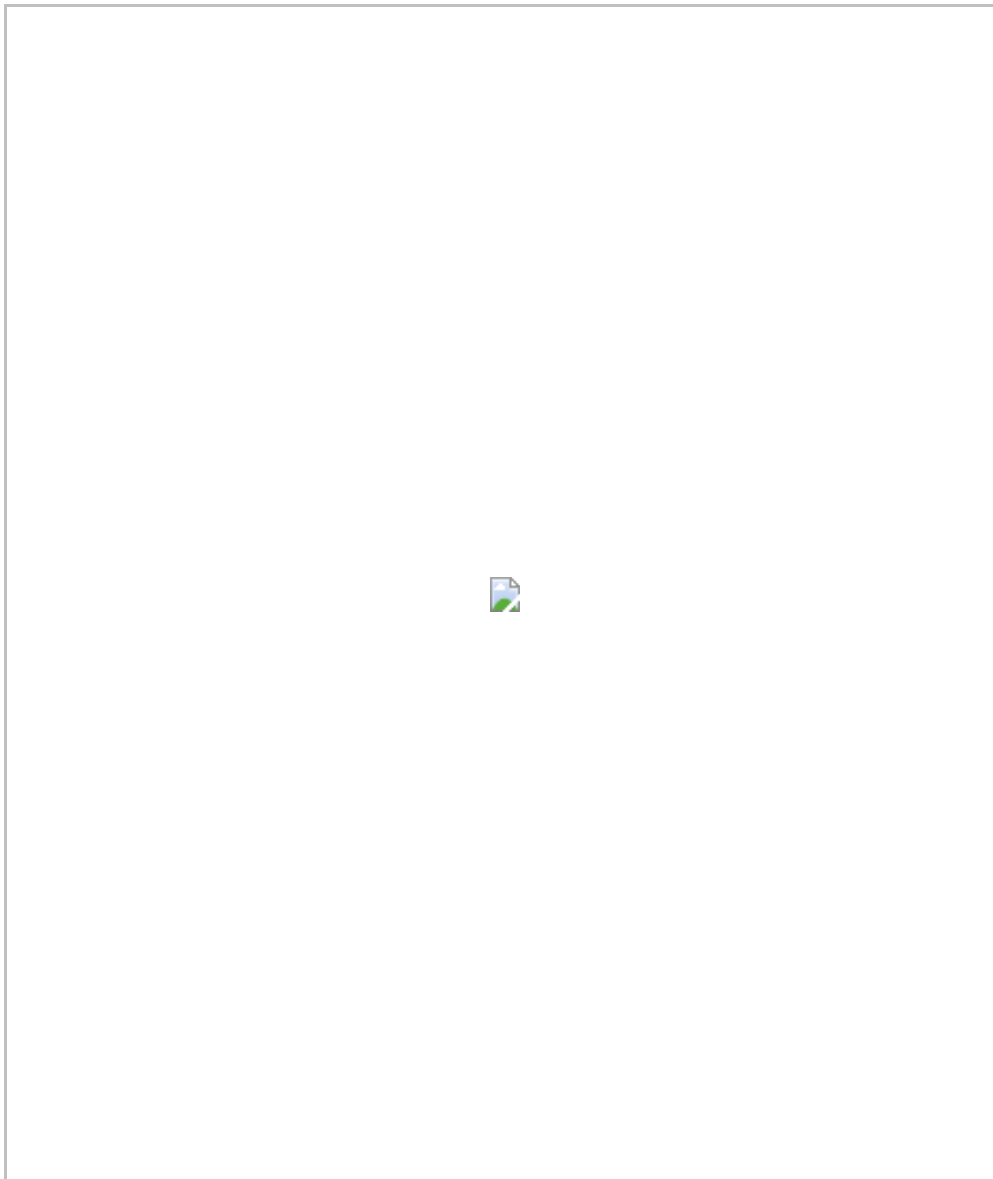
The next railroad to succumb was FCALP, again owing to adverse weather conditions, namely the heavy rains that fell during the Bolivian winter in the 2001 season, which caused the Luta river to overflow its banks. (This river runs into the ocean at Arica in Chile.) In mid-February 2001, the waters swept away four sections of the FCALP track, damaging bridges and embankments. The cost of minimum repairs was about US\$ 5 million and a relocation of the track to make it more resistant to this type of disaster would have cost US\$ 18 million. The leaseholder of the FCALP railroad had been operating at a loss amounting to approximately US\$ 1 million per year.

The Government of Chile accepted in principle to finance the repairs, but in mid-2001 the service was still

suspended. A bi-modal option is being considered whereby the freight would be transported by train as far as Poconchile, approximately 30 kilometres from the port of Arica, then by truck over the last segment. However, this option would have a limited attraction for users.

The suspension of FCALP operations has also meant the partial deactivation of all existing Bolivian railroads north of Oruro, due to the lack of a port in the Pacific coast suitable for channelling the traffic.

Subsequently, C14 gave up the ghost, this time as a result of human rather than natural factors. In mid October 2000, the Ferronor railroad companies (Chilean) and Belgrano Cargas (Argentine) had signed an agreement that allowed the Chilean trains to reach Güemes (near Salta), with the former paying the latter a fraction of the freight charge that corresponded to the use of their sector.



In January 2001, Chilean trains were already unloading their freight in the Argentine city of Ledesma, but afterwards, differences arose between the two companies vis-à-vis the interpretation of the agreement. These differences were not solved and in April international traffic came to a standstill, and in the middle of the year was still suspended. On the other hand, the company that operates the tourist service “Train of the Clouds” (Tren de las Nubes), in the segment Salta to San Antonio de los Cobres in the Argentine section of the C14, is contemplating extending its service to Antofagasta, Chile.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

## NEW SIGNS OF REACTIVATION OF THE TRANSANDEAN RAILROADS

Thus, the only transandean railroad still operating in mid-2001 is the FCAB. In 2000, it transported 3.3 million tons, more than in any other year of its over 100 years of existence and there is a clear trend for this traffic to increase. Although the bulk of this traffic is domestic between Chilean points, the exchange with the Bolivian Andean Railroad (Ferrocarril Andino Boliviano, FCA) has been favoured by the controlling interest that it acquired in the Antofagasta P.L.C., which is the company that owns FCAB, and by the diversion of some additional traffic to the port of Antofagasta, Chile, caused by the closure, at least on a temporary basis, of the FCALP line.

There is a project that contemplates the construction of a new transandean railroad in the south and to put the FCT back in operation. In the middle of the decade of the 90s, the Governments of Chile and Argentina commissioned a feasibility study for the construction of a low altitude tunnel in the axis Mendoza-Los Andes in Chile and Argentina respectively, through which trucks would be transported on flatbed railroad cars following the model adopted between England and France. Nevertheless, the necessary investment would be well over US\$ one billion, which no entity or organization has offered to finance.

Later on, in the year 2000, the Argentine engineering company, Tecnicagua drafted a study for rebuilding the FCT over the previous route, but without the toothed bar system. The toothed bar system would be replaced by the system of operating adhesion trains over gradients of up to 8%. Tecnicagua believed it would be able to transport 3 million tons a year, that is, almost ten times the potential capacity estimated by the Latin American Railroad Association (Asociación Latinoamericana de Ferrocarriles, ALAF) thirty years before, and more than 15 times the maximum volume that the FCT was able to transport in the past between Chile and Argentina.

In mid 2001, the project was on hold, pending its classification by the Government as a project of public interest; once this has been obtained and more detailed studies carried out, invitations to tender can be issued. Tecnicagua estimates the necessary investment at approximately US\$ 120 million and believes that the trains could be running by March 2004. Further detailed studies may be warranted to determine the investment requirements and the transport capacity of the reactivated FCT.

The bi-national tunnel, through which the FCT tracks run, is located at 3,200 metres above sea level, and to reach that altitude the trains had to climb gradients of up to 8% in Chile and 6% in Argentina. The steep gradients and sharp curves limit the transport capacity and increase operational costs, while the altitude means that there is the constant threat of winter snows blocking the track, sometimes for several weeks at a time.

Therefore, from the point of view of supply, the FCT was badly located. On the other hand, since it is fully in the Santiago/Valparaiso (Chile) – Mendoza/Buenos Aires (Argentina) corridor, it is well located from the point of view of demand. The opposite is true of the proposed Southern Transandean railroad, which would connect the Argentine railhead in Zapala, through the Chilean Mallín Pass, with the Chilean railhead, which is in principle located in Lonquimay, although, in practice, it is now really located in Pua, because the 100-kilometre branch line between those two towns had been abandoned. The principal force behind the project for building the Southern Transandean is the government of the Argentina province of Salta, whose enthusiasm for the project has reached such a point that it has ordered the construction of some preliminary works.

The enthusiasm of Neuquén has not found an echo in Chile, where the operations of the Pua-Lonquimay branch were phased out at the end of the 1980s and the railroad tunnel Las Raíces has been adapted to road

traffic. Recently, the branch line was partially dismantled and bridges reassigned for road traffic to allow fully laden trucks to circulate without height restrictions.

The advantage of the Southern Transandean in comparison to the FCT is that the climb through the mountains would be no more than 1,750 metres; the gradients are not significantly higher than 2%, and it would use a wide gauge of 1,676mm, the same as on other lines in southern Argentina and Chile, with which it would link up. Therefore, it would have a large capacity, quite low operational costs and would be relatively immune from the destructive and obstructive action of winter weather. Since it is far from the principal commercial corridors, the potential demand for its services would be more limited. Even if this is the case, studies carried out during the 1990s by the Argentine Federal Investment Council (Consejo Federal de Inversiones) and Bechtel, a United States engineering company maintain that the international traffic would be approximately 1.4 million tons. It was also estimated that the rate of return on the private investment necessary to build and equip it (about US\$ 370 million) would be at least 10%. Since the gradual phasing out and partial dismantling of the Pua to Lonquimay branch would imply additional costs, the construction of the Southern Transandean remains a real possibility.

Private and public organizations in different European countries have shown an interest in the project. However, it is not known how far they would be willing to assume the commercial risk to build it and then charge for their services on the market, or if they merely want to act as building contractors on behalf of another entity. Perhaps the greatest difficulty that must be overcome to get the Southern Transandean running is the one presented by the numerous companies and other entities involved in the matter. Some of these are: the Pacific Railroad (Ferrocarril del Pacífico) which is the Chilean railroad concessionaire, FerroSur Roca the Argentine concessionaire, Chilean State Railroads (Ferrocarriles del Estado de Chile) owner of the Pua to Lonquimay branch line, the government of the province of Neuquén.

As far as transandean railroads in South America are concerned, in recent decades, there have always been more words than actions. However, in the case of the Southern Transandean, some action may yet be in the offing.

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