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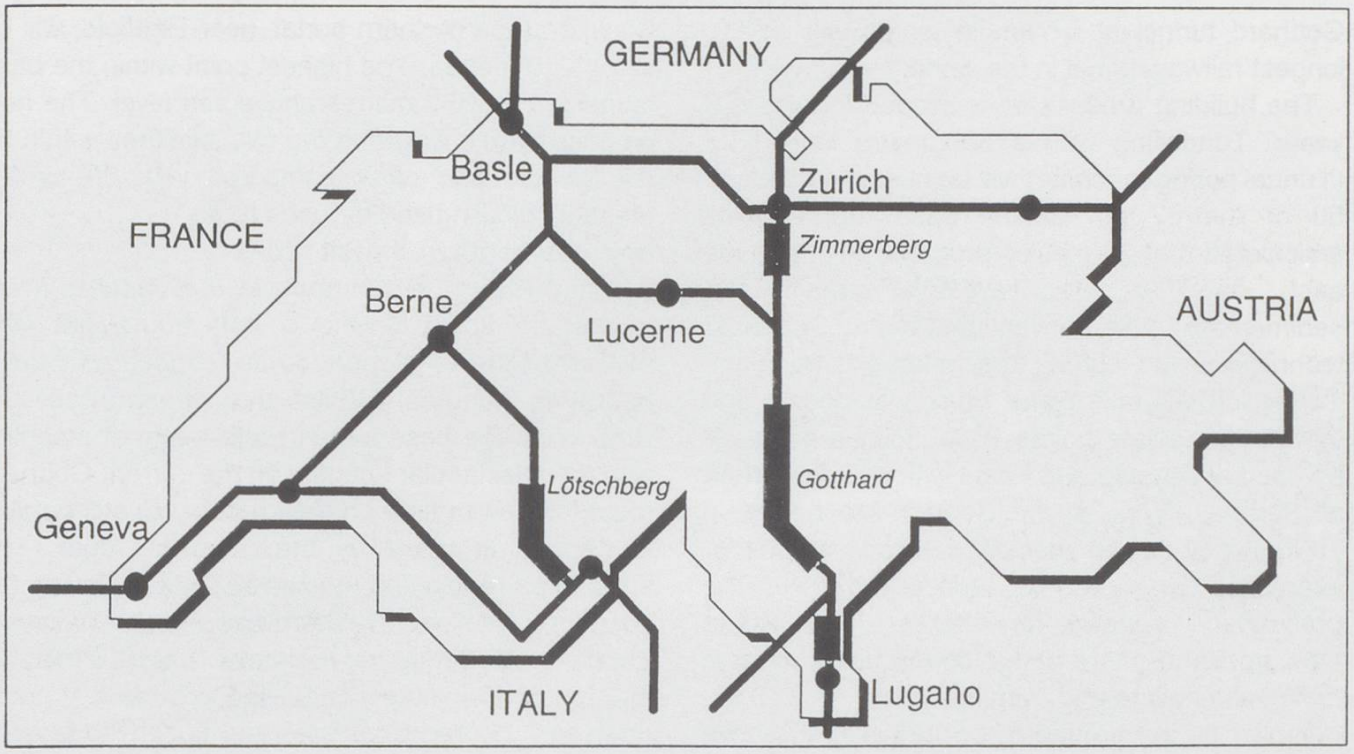
The AlpTransit Scheme



AlpTransit Update; 3 Gotthard

Continuing our series on AlpTransit **Peter Marriott** *provides further information on the new Gotthard base tunnel forming part of the AlpTransit project.*

To recap, readers will recall that the AlpTransit project is intended to be Switzerland's contribution to the improvements needed in traffic between north and south Europe. Following the unification of Europe traffic is growing and the Alpine barrier provides a natural obstacle to this expanding movement of people and things. Freight traffic across the Alps has almost tripled in the last 25 years. A further expected doubling of freight traffic and 50% increase in passenger traffic by 2020 is anticipated.

The Alps are crossed by four railway routes; in France the Mont Cenis, in Austria the Brenner and in Switzerland by the Gotthard and Lötschberg. Currently about one fifth of all freight traffic crossing the Alps uses Swiss roads and railways. The intention of the Swiss is to halt the increase in road traffic and divert freight onto the railways.

In the 1940's the first ideas for a Gotthard base tunnel emerged. As freight traffic using the route grew there were various intentions to build a base tunnel but the immediate solution was to build the Gotthard motorway and to double track the Lötschberg line.

New Gotthard base tunnel

The full Gotthard base tunnel route is envisaged to include a 10km tunnel between Thawil and Litti (an extension of the Zimmerberg tunnel project to Thawil as part of the Bahn 2000 project) in addition to the 15km Ceneri base tunnel between Bellinzona and Lugano.

For the new Gotthard tunnel engineers were faced with four alternatives;

- a double track bore with a separate service tunnel. This would be similar to the Seikan tunnel in Japan.
- two single track bores with a separate service tunnel. This was the chosen formation of the Channel Tunnel.
- three single track bores. This would provide maximum flexibility but would be the most costly.
- two single bores without a service tunnel.

The last alternative was chosen in view of cost and construction time considerations. The tunnel bores will be 9.4 metres in diameter and 30 metres apart. Cross passages will be installed at about 325 metres. Two crossovers will facilitate the use of a single bore when necessary by service trains. Emergency stations will be provided near the crossovers which are situated at the foot of the Sedrun shaft and the inclined Faido shaft. The new

Gotthard tunnel at 57 km in length will be the longest railway tunnel in the world.

The building process is envisaged to take in 9 years. Tunnelling with a 300 metre long TBM (Tunnel boring machine) will be possible for about 50 of the 57 km of the base tunnel. It is anticipated that 20 metres progress will be made each day. At the Tavetsch massif and sedimentary rocks conventional boring and blast techniques and cutting machines will be used. Tunnelling will take place from both portals and three intermediate points. Two inclined adits will be used at Amsteg and Faido with a vertical shaft at Sedrun. Work at the Sedrun site began in 1996. It includes an attack access adit, an adit for evacuated air and a vertical shaft to the preliminary construction faces. The Furka Oberalp Bahn metre gauge line is being used to move materials to and from this site.

Whilst all the ground to be tunnelled is above sea level there is a risk of flooding during construction. The underground rock formations are already being studied in detail before the commencement of the tunnelling work. About 85% of the rock to be tunnelled is considered to be favourable (largely crystalline) by rock engineers but the balance of the rock formation is sedimentary and formed from a combination of rock types which may be more difficult to excavate. The Tavetsch massif and the Piora basin have been under review and exploration since 1993. Exploration work for the base tunnel began as long ago as 1989. The faults at Bassa di Sou are already being explored from an excavated gallery at Faido. Tunnelling will take place at a maximum of 2000 m below ground level with temperatures of up to 50 degrees. The alignment of the tunnel will be curved to avoid some difficult conditions and to take into account the height of the overburden.

It is anticipated that some 43 million tonnes of spoil will be obtained. It is intended to use about one third of this on the project itself with another third for connected construction works e.g. avalanche protection with the remaining quantity utilised to fill up gravel pits etc. Exploratory drilling galleries will not be obsolete once the tunnel is open because they will be utilised for drainage.

The southern portal of the tunnel will be at Bodio which is about 25km north of Bellinzona. The difference in height above sea level between Bodio and the northern portal, near Erstfield, will be about 200 metres. The highest point within the base tunnel will be 550 metres above sea level. The new proposed route will bring the two locations within 59 rail km of each other compared with 83 by the present spiralling and tortuous route.

Improvements in transit times

Today's EuroCity trains cover the Basel to Milan journey in about 5 and a half hours but with AlpTransit this is intended to be reduced to about 3 hours 45 minutes. Whilst the views out of the window on the base tunnel route may not compare with the spectacular scenery on the current Gotthard route those with time on their hands will still be able to choose to travel by the "classic" route. The anticipated reductions in journey times following the opening of the new Gotthard base tunnel route are Zurich to Milan from the present 4 hours 10 minutes to 2 hours 40 minutes; St Gallen to Lugano 4 hours down to 2 hours 50 minutes and Luzern to Lugano from 2 hours 40 minutes to 1 hour 30 minutes.

Traffic predictions and facilities are generally based on the following classifications of traffic; high speed passenger services, inter city passenger trains, "modern" freight trains, intermodal container, rolling road (Hupac), wagonload trains and local passenger services. The tunnel infrastructure will be based on maximum lengths of trains of 1500 metres and maximum weight of 4000 tonnes.

In the next issue of SWISS EXPRESS we will report on the results of the vote on 19 November 1998 by the Swiss people regarding the go-ahead of the NEAT (AlpTransit) project.

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Data concerning the new Gotthard line

Length of the new line	about 125km
Length of the new base tunnel	57km
Gradient (max)	12.5‰
Radius of curvature (normally)	4000m
Highest point of base tunnel	550m
Capacity of base tunnel (total of both directions)	300 trains per day
Freight capacity of entire axis including old line	50 million tons per year
Date of operation	2006/2007