

<b>Zeitschrift:</b>	Swiss express : the Swiss Railways Society journal
<b>Herausgeber:</b>	Swiss Railways Society
<b>Band:</b>	- (2019)
<b>Heft:</b>	137
<b>Artikel:</b>	Switzerland, signalling, and scenery. Part 1, Ian Moore's report on the IRSE Conference in Switzerland
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<b>DOI:</b>	<a href="https://doi.org/10.5169/seals-853795">https://doi.org/10.5169/seals-853795</a>

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## Switzerland, Signalling, and Scenery.

### Part 1 of Ian Moore's report on the IRSE Conference in Switzerland

Ceneri Base Tunnel (CBT) north end construction site. A demonstration length of slab track.

All photos: Ian Moore. All taken on 30 May 2018

From 28th May to 1st June 2018, the Institution of Railway Signal Engineers (IRSE) visited Switzerland for its Annual Convention. About 200 members and 80 guests including my wife Lynda, and myself attended. This was not the first IRSE Convention in Switzerland; I attended the last two in 1977 and (with Lynda) 2006. The IRSE represents signal and telecommunications engineers worldwide. Our members are very proud that nearly half of our number live outside the UK – unusual for a UK-based engineering institution. That reflects the lack of anything comparable elsewhere. The IRSE has local sections both in the UK (I'm on the York Section Committee) and overseas. The Swiss Section is particularly active and was very keen that we should visit Switzerland in 2018! As before, the Swiss could offer us cutting-edge technology and fantastic scenery – a winning combination!

The theme for 2018 was 'Safety in Tunnels'. In 2006 we visited the Lötschberg Base Tunnel (LBT) before it opened and this time we visited the Gotthard Base Tunnel (GBT), Ceneri Base Tunnel (CBT) and the New Albula Tunnel. The guests meanwhile enjoyed their own programme including a model village, mountains, a glacier and a boat trip. The Convention was based upon two centres: Lugano and Pontresina. On our first full day in Lugano we had a morning listening to papers concerning what we would see at the Convention as a whole. We then went by coach to visit the north end of the CBT. We were able to visit the construction site and examine the ground equipment. The following day would see the lay-

ing of the 'Golden Sleeper', representing the completion of track laying. The CBT, at 31 km, will be the next stage of the Gotthard upgrade and will enhance both journey times and capacity as well as avoiding steep gradients. The signalling (ERTMS – European Rail Traffic Management System – Level 2) and the associated safety systems are obviously critical to the safe management of the railway in both the CBT and GBT.

The next day we visited the GBT. We were shepherded, with typical Swiss efficiency, to Lugano-Paradiso Station where we joined a special train of two Gotthard Panoramic Express coaches and two more conventional coaches hauled by a Class 420. At Biasca half the party, who would follow the same itinerary as us but in reverse, detrained and we continued over the "Classic" route to Erstfeld. Because of the heavy snow in the Alps the previous winter, the heavy and late snow melt



Approaching Altdorf from the south. ERTMS Block Marker (virtual signal), and shunt signal to the left and a balises pair to the right.

meant that the many waterfalls were exceptionally full-flowing; a significant bonus. Also, the old St. Gotthard Pass road had only recently reopened, unusually late. We could see it high above us with the high banks of snow, on either side of the ploughed roadway clearly visible. We alighted at Erstfeld where we received a further lecture, this time on the train health monitoring system deployed across the SBB, but particularly important for trains before they enter, and while they run through, such a long tunnel as the 57 km GBT, the longest rail tunnel in the world. We then enjoyed a buffet lunch to the strains of the local brass band and saw such things as the GBT Rescue Train, a rotary snow plough and a mobile tunnel door that is deployed to limit draughts induced by trains in the adjacent tunnel during maintenance work. After lunch we joined a chartered TILO Class 524 train for the run to Altdorf where we reversed and ran through the GBT to Biasca. Altdorf was interesting in that it was signalled exclusively with ERTMS Level 2, without lineside signals, meaning that even trains using the old route had to be fitted for ERTMS.

It should be noted that Switzerland is particularly advanced when it comes to the introduction of ERTMS. The EU (European Union) promotes the use of ERTMS so as to facilitate interoperability and thus an open market for train operators and also an open market between signalling manufacturers; not possible with separate legacy national signalling systems each supplied typically by one, domestic, producer. Although outside the EU, Switzerland also supports this. ERTMS is intended to achieve these aims with priority being given to implementation over the designated major TEN –T (Trans-European Transport Networks) corridors. The Lötschberg and Gotthard Routes are part of the Rhine – Alpine TEN corridor from Rotterdam and Antwerp to Genoa and Milan. Switzerland's approach has been to provide ERTMS Level 2 (currently the most advanced form, which retains train detection – track circuits or axle counters – but delivers movement authorities to the train by radio) through the LBT, GBT and CBT and also on new lines and wherever lines require higher capacity. Elsewhere, the existing simpler warning systems used on SBB and BLS – 'Indusi' and 'ZUB' - are being replaced with ETCS L1 LS (European Train Control System Level 1 – Limited Supervision; ETCS [European Train Control System] is a part of ERTMS together with GSM-R, the radio system used with Level 2) using ETCS ground equipment: balises (beacons) in pairs with, where required, "Euroloop" radiating cable aerials used to give continuous transmission on the approach to a signal. ETCS L1 LS serves both ERTMS equipped and non-ERTMS equipped trains; all of the latter running in Switzerland have been modified to read both the old ground equipment and the ETCS equipment. The data telegrams transmitted by the ETCS L1 LS ground equipment to the trains include a section, "Packet 44", that is available for

national requirements and which, in Switzerland, delivers the 'Indusi' and 'ZUB' information, so that is what the non-ERTMS trains use. Replacement of the existing 'Indusi' and 'ZUB' ground equipment is virtually complete which means that any foreign train equipped with ERTMS to the latest baseline can run almost anywhere in Switzerland. As the "Limited Supervision" in the title suggests, ETCS L1 LS is not a complete Automatic Train Protection system; it will replicate the functionality of 'Indusi' and 'ZUB' – whichever was installed at the signal concerned. ZUB offered a higher degree of supervision than 'Signum' and was used in cases where a Signal Passed At Danger would be particularly dangerous. From 2025 there will be a general rollout of ERTMS level 2 system wide; this will feature a new radio solution to replace GSM –R.

The Convention was the first time that a Class 524 had carried passengers through the GBT. We ran through at 140 km/h, slowing down to examine one of the two intermediate rescue stations. The GBT has two single-track running tunnels but – unlike the Channel Tunnel for example – no separate service tunnel. So where possible, if a train with an on-board emergency could not safely reach the tunnel exit, the aim would be to detrain passengers at a rescue station. 



**TOP:** Ceneri Base Tunnel (CBT) north end construction site. A 160 km/h turnout, showing the first of three point actuation thrusters with, at the sleeper end, the hydraulic power pack.

**MIDDLE:** Ceneri Base Tunnel (CBT) north end technical building.

**LEFT:** A portable tunnel door used to protect workers from excessive draughts due to train movements in the parallel tunnel bore.